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Essays on Corporate Hedging, Ownership Structure and Financial Conservatism Policies

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by

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ABSTRACT

Corporate hedging strategies are those risk management mechanisms used by firms to reduce their exposure to the risk of price movement in the financial markets. In Modigliani and Miller's theorem, corporate hedging and corporate financing are irrelevant in a perfect capital market, as firms may not derive any benefit from them. In the presence of market imperfections, however, these two corporate policies become important and matter to the shareholder value maximisation objective because of the presence of taxes, financial distress costs, agency costs, and transaction costs. Thus, unless a firm has hedging strategies in place to reduce the impact of capital market imperfections, it may not be able to invest in valuable projects or meet financial obligations, which may lead to lowered firm performance. This may be so because without hedging, firms may, at some point in time, encounter variability in the cash flows generated by assets in place. In view of this logical implication, finance literature implicitly suggests that corporate hedging matters.

This thesis investigates whether corporate hedging matters by investigating the determinants of hedging policy. It also examines the influence that ownership structure has on the relationship between hedging and corporate performance. The thesis goes further to examine why firms choose to adopt a conservative financial structure at the possible expense of shareholders. Thus, the thesis comprises three different empirical chapters.

In Chapter 2 of the thesis, we examine the rationales for corporate hedging. The main objective of the chapter is to empirically investigate whether the incentives for corporate hedging under different macro-economic conditions – pre-financial crisis, during a financial and after a financial crisis, differ. In general, hedging theories suggest that the characteristics of an imperfect capital market such as the expected cost of financial distress, underinvestment problems, tax liability, agency problems and information asymmetry create incentives for firms to hedge in order to stabilise their cash-flow (Froot et al. 1993; Smith and Stulz 1985). To achieve the above-stated objective, the chapter examines two broad research questions. The first research question is: what are the incentives for hedging, in general? Second, we investigate if there are differences between the factors that make firms hedge in tranquil macroeconomic conditions and during a financial crisis. The first research question provides us with the opportunity to compare our findings with those of previous studies and the second

question provides the main contributions of the study. The chapter considers that macroeconomic conditions are not always similar, as there may be three distinct macroeconomic periods: pre-financial crisis, during financial crisis and post crisis periods. Therefore we cannot treat the factors that induce corporate hedging during the three sub-periods as though they were homogenous.

Using logistic models to analyse a sample of UK non-financial firms that are quoted on the London Stock Exchange FTSE ALL SHARE we present several important findings. First, we show that derivatives are commonly and increasingly used by non-financial firms, as we find that about 55 per cent of our sample hedged with derivatives in 2005 and this increased to almost 64 per cent in 2008. Second, the analysis indicates that leverage, capital expenditure, size and exposure to foreign exchange risk are firm-level factors that significantly induce corporate hedging decisions. Third, we find that the factors that induce corporate hedging activities in normal macroeconomic conditions are different from the ones that induce hedging decisions during a financial crisis. Specifically, the analysis shows that tax liability is significantly important to hedging decisions during a financial crisis period but not during tranquil macroeconomic conditions. In addition, our analysis reveals that factors such as dividend pay-outs, capital expenditure and the shareholdings of institutional investors, particularly investors with fewer business ties, significantly create incentives for firms to engage in hedging activities in the pre-financial crisis period; however, the influence of the factors on the decision to hedge is insignificant during the crisis.

In Chapter 3, we investigate the implications of corporate derivatives usage by focusing on the interaction effects of derivatives usage and ownership structure on firm performance. Theories indicate that corporate hedging is a value-maximising strategy in the presence of the probability of financial distress, underinvestment problems, tax liability, agency problems and information asymmetry, as it would stabilise firms' cash-flow to ensure they are able to cover operations and financial obligations (Froot et al. 1993; Smith and Stulz 1985). Using unbalanced panel data of U.K non-financial firms, over 2005-2011, we address the research question, how does the relationship between hedging and firm performance change relative to ownership structure? We argue that if ownership structure can be used by firms to reduce agency problems, then the value-maximisation effects of hedging on performance would not be strong in firms with a high ownership structure (managerial or institutional ownerships).

The empirical analysis in the chapter reveals important findings. First, we find that there is a negative association between hedging and performance as measured by Tobin's Q. Second, we find that the effect of hedging on the performance of firms with high board of directors (institutional) ownership is different from those with low board of directors (institutional) ownership. Specifically, we find that the effect of hedging on the performance of firms with high board (institutional) ownership is weaker than in firms with lower board (institutional) ownership. The analysis suggests that there is no performance benefit associated with the use of hedging. Last but not least, we observe that institutional investors that have fewer business relations with a firm (i.e., grey investors) actively monitor and influence firms' decisions to make decisions that induce good performance, as we find a positive association between the holdings of grey investors and firm performance.

Chapter 4 of the thesis investigates the factors that make firms follow a conservative financial policy despite the potential benefits of debt financing. More specifically, the chapter investigates whether corporate hedging plays a significant role in influencing financial conservatism policies. We emphasise that the optimal leverage level of each firm must be considered when identifying whether a firm is financially conservative or not. Thus, we estimate a leverage model that takes into account financial constraint, investment opportunities, asymmetric information and profitability, and thus identifies four different types of conservative firms, namely the low-leverage firms, nearly low-leverage firms, nearly zero-leverage firms and zero-leverage firms.

Using a sample of UK non-financial firms over 2000-2013 in logistic regression analysis, our analyses reveal very important findings. First, in separate logistic regressions for the four different leverage conservative policies (low-, nearly low-, nearly zero- and zero-leverage policies), we find that the factors that make firms adopt the four policies are not similar. For example, underinvestment problems as measured by growth opportunities contribute to the conservative decisions of nearly low-, nearly zero- and zero-leverage firms but not to those of low leverage firms. Also, we find evidence that the percentage of firms that follow financial conservatism policies declines during the financial crisis, suggesting that leverage conservatism is pro-cyclical. Finally, we find that hedging with derivatives plays a significant role in leverage conservatism decisions, particularly low-leverage and nearly low-leverage policies. The findings of this chapter add to the growing body of literature that investigates leverage

conservatism. Also, the chapter contributes to knowledge in the field of corporate finance on the importance of risk management.

Overall, the analysis of this thesis provides new insight into our understanding of the importance of capital market imperfection in determining corporate policies including, corporate hedging, leverage and corporate performance. More specifically, the study reveals that firms that are susceptible to financial distress, tax liability, underinvestment problems and agency problems are more likely to engage in hedging activities during a financial crisis. In addition, the study reveals that the role of corporate hedging in performance may be insignificant in those firms that have in place mechanisms that may work in similar ways to corporate hedging. This is because as far as ownership structure reduces the impact of capital market imperfection on performance by mitigating agency problems, hedging may not be necessary. Similarly, since hedging may be costly, the impact of hedging on performance may be negative, as the market may perceive the activity unfavourably. Further, in the light of capital market imperfection, the findings of this study provide plausible evidence that hedging matters in deciding whether firms would be conservatively levered or not, as hedging firms would not find it difficult to issue debt.

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This thesis is dedicated to God almighty and to the memory of my loving parents; Engr. Samuel Adekunle Babajide and Mrs Helen Babajide.

CHAPTER 1: INTRODUCTION AND OVERVIEW OF THE THESIS

1.1: Introduction

One of the concerns of modern corporations is the exposure of cash flows to risk in the price movements of interest rates, foreign currency and commodities. This becomes a concern because when there is a high variation in cash flow, that is, a high likelihood of experiencing shortfalls in internal cash flow, firms may have an increased need for external capital, which in turn may increase the costs of capital (Froot et al. 1993; Minton and Schrand 1999). If a capital market were perfect and complete, volatility in a firm's cash flow would have no effect on the costs of capital because the market has no imperfections in the first place. Thus, financing decisions would be irrelevant (Modigliani and Miller 1958). In an imperfect capital market, however, unless a firm has hedging strategies in place to reduce the impact of capital market imperfections such as tax, financial distress costs, agency costs, informational asymmetries problems and transaction costs, it may be compelled to seek external funds that may be more expensive than the internal ones. Thus, if a firm experiences cash flow volatility without having hedging in place, there may be disruptions to investment and other financial obligations, which in turn may adversely affect the overall performance of the firm (Froot et al. 1993; Smith and Stulz 1985). In this line, therefore, hedging creates a wedge between the costs of internal and external capital. In the light of this, finance literature implicitly suggests that corporate hedging matters.

There has been increasing progress in the finance literature with regard to the developing and testing of theories to establish the relevance of hedging and that of financing policies, and the 2008-2009 global financial crisis further revived interest in these issues among academia, corporations, regulators and policymaking institutions. For instance, there is an extensive study that covers the determinants of corporate hedging strategies as well as studies on the implications of hedging. The well-known hedging theories, for instance, indicate that the expected costs of financial distress (Smith and Stulz 1985), agency costs associated with underinvestment and risk-shifting problems (Bessembinder 1991; Campbell and Kracaw 1990; Froot et al. 1993; Myers 1977), tax liabilities (Smith and Stulz 1985), and information

asymmetry (Breeden and Vismanathan 1996; DeMarzo and Duffie 1991) create incentives for firms to hedge. In the presence of high costs of financial distress, for instance, a levered firm has an incentive to hedge with derivatives to stabilise its cash-flow, and in so doing, would have sufficient funds to meet its obligations (Smith and Stulz 1985). Also, the underinvestment hypothesis[1] argues that firms with an underinvestment problem have an incentive to hedge, as hedging would ensure the firms have sufficient funds to finance valuable projects (Froot et al. 1993). In mitigating the impact of capital market imperfections that are mentioned above, hedging maximises firm performance (Breeden and Vismanathan 1996; DeMarzo and Duffie 1991; Froot et al. 1993; Smith and Stulz 1985). For example, in the presence of underinvestment, when internally generated funds are more costly than externally generated ones, hedging would ensure that firms that may find it difficult to access external finance do not forgo valuable projects but have sufficient funds to undertake the projects, thereby enhancing performance (Froot et al. 1993).

Despite the growing number of studies on corporate hedging, unfortunately, there are still some questions that remain unclear. For instance, it is not clear if the factors that make firms engage in hedging activities are the same in all macroeconomic conditions, i.e., during financial crisis and in normal macroeconomic conditions. Also, it is not clear if having a mechanism that works in the same way as hedging, as far as capital market imperfections are concerned, will reduce the impact of corporate hedging or make it insignificant. Further, there is need to know whether hedging plays an important role in the puzzling financial conservatism policies: policies where firms carry leverage that is less than that suggested by the prominent capital structure theories and at the extreme, firms not issuing any debt.

The overall objective of this thesis is to critically examine and understand whether corporate hedging really matters by answering the above mentioned questions. We believe that answers to the questions are particularly important, as they would help us to better understand whether there is a role for hedging in all corporations that have the incentives. Existing literature on corporate hedging suggests that hedging is a value-maximising strategy, as it will help firms to reduce the impact of capital market imperfections. The implicit suggestion of this argument is that hedging has the ability to improve the value of all hedging firms that have the incentives

[1] An underinvestment problem arises when externally generated funds are sufficiently expensive for a firm to induce a firm to reduce investment spending or forgo carrying out investment activities during times when internally generated funds are not sufficient to finance growth opportunities (Froot et al 1993; Minton and Schrand 1999).

to do so. However, the perception of this thesis is that although hedging is a value-maximising strategy, there are some firm characteristics (such as ownership structure and size) and market conditions that can impede the benefits that may be derived from the activity. First, we acknowledge that corporate hedging and ownership structure are not substitutes, as companies do not choose their ownership structure instead of corporate hedging. However, by construction, as in the case of corporate hedging, ownership structure can mitigate the impact of capital market imperfections such as agency problems (Fama and Jensen 1983a&b; Jensen 1986). Then, the role of corporate hedging may be reduced or insignificant in those firms, which have mechanisms that may work similarly to hedging, as far as reducing the impact of market imperfections is concerned.

Second, the impact of hedging on firm performance may be insignificant in the presence of ''market conditions'', i.e., costly corporate hedging. As suggested by theories, we agree that a firm chooses to hedge because there is a benefit in doing so. However, hedging is not necessarily a costless activity[2], as there are costs of implementing the strategy, which include transaction costs (Froot et al. 1993; Froot and Stein 1998; Mello and Parsons 2000), informational cost (Hirshleifer 1988) and holding costs (Stulz 1984). Thus, in the presence of the costs of hedging, firms would only hedge to the point where the marginal costs and the marginal benefits of hedging are equal. However, if a firm engages in hedging activities when hedging is costly, i.e., when the marginal cost of hedging is higher than the benefits, then the impact of hedging on performance may be negative. This is because by engaging in corporate hedging activities unnecessarily may not help the firm, particularly if the firm already has an ownership structure in place to serve a similar purpose. If hedging is a costly activity, then the market may not appreciate it, as the market may believe that the firm is bearing unnecessary costs. To achieve the objective of this study, therefore, the thesis is divided into three main empirical chapters.

In the first empirical chapter, we examine the firm-level factors that contribute to hedging decisions. Starting from Nance et al. (1993), a number of empirical studies have been conducted that investigate firms' motives for engaging in hedging activities. For example, Lel (2012) investigates the effects of corporate governance structure on a firm's motive for hedging with

[2] It is beyond the scope of this thesis to discuss in details the costs of hedging. However, the understanding that hedging is not a costless activity helps our discussion on the implication of the activity.

derivatives by using a sample of firms from 30 different countries over 1999-1999. Lel reports that firms with weak governance use derivatives for managerial reasons and firms with strong governance use derivatives to mitigate costly external financing. Purnanandam (2008) employs a sample of 2000 U.S firms for 1997 to investigate firms' motives for hedging. He reports that there is strong evidence that expected costs of financial distress and firm size motivate firms to engage in hedging activities. Also, Geczy et al. (1997) employ a sample of firms drawn from the *Fortune 500* for 1990 to investigate firms' motives for hedging with currency derivatives. They report that, although firms with high-growth opportunities and tighter financial constraints have a high tendency to use currency derivatives, expected costs of financial distress have a weak effect on a firm's propensity to hedge.

Despite the number of empirical studies that have been conducted, there are yet some important questions that are left unanswered, including: do we have to consider that the incentives for hedging are similar under different macroeconomic conditions? This question is important because most contemporary studies that have conducted investigations into firms' motives for engaging in hedging activities undertook the studies as if the incentives for hedging are similar under all macroeconomic conditions. The extant literature argues that persistent negative macroeconomic uncertainty, which may be one of the features of a financial crisis period, may have ripple effects on firms and the financial markets at large, to the extent that there may be increased adverse selection and moral hazards, which may induce firms to change their decision, and at the same time hinder the central functions of financial markets (Haddow et al. 2013; Hoque 2013; Bernanke and Gertler 1989). For example, some firms may find it more difficult to access external financing because of a severe credit crunch, and managers may even find it difficult to anticipate the outcome of their own actions or how the changes they make to their firms' financial policies may affect their firms during a crisis (Baum et al. 2006; Duchin et al. 2010).

The central objective of the chapter, therefore, is to empirically investigate whether the incentives for corporate hedging differ under the three sub-periods characterised by different macro-economic conditions – pre-financial crisis, during a financial and after a financial crisis. The chapter probes two main research questions. The first question that is addressed in the chapter is: what are the factors that motivate firms to hedge, in real practice? Then, we investigate the question: do the firm-level factors that induce hedging decisions in normal

macroeconomic conditions differ from those that induce hedging decisions during a financial crisis period?

The chapter is motivated by three main factors. First, the chapter is motivated by the increasing number of firms that engage in hedging activities. According to the Bank for International Settlements' reports, the notional amount of financial derivative instruments that were used increased from about $100 trillion in 2000 to almost $700 trillion in 2009 (See Appendix 1.1) and 94 per cent of the firms that used the instruments in 2009 did so to hedge business and macroeconomic risks (BIS; ISDA 2009). Second, existing theories as well as the follow-up empirical studies provide extensive arguments and rich results respectively, to emphasise the factors that induce firms to hedge, in general. However, there has been little explanation on whether the motives for hedging during macroeconomic shocks are the same as those in tranquil economic conditions. This might not be the case because of several reasons. The level of leverage (if leverage can be used as a proxy for expected financial distress costs) used by firms may be influenced by the prevailing macroeconomic situation, as it may be counter-cyclical or pro-cyclical (Bernanke and Gertler 1989; Choe et al. 1993; Dang 2013; Kiyotaki and Moore 1997; Korajczyk and Levy 2003). For example, Graham et al. (2011) find that one standard deviation increase in leverage increases the probability of encountering financial distress by 31 per cent during the 2008-2009 financial crisis period. In addition, some firms may find it more costly and/or difficult to obtain external capital at the markets during financial crisis because of tightened regulations and requirement and sometimes inefficiency on the part of the markets[3] (Hoque 2013; Song and Lee 2012). Also, it is argued that managers find it difficult to accurately predict their firms' cash-flows during a financial crisis, to the extent that they make decisions that they would not have made otherwise (Bartram et al. 2011; Baum et al. 2006). The third motivation of the chapter is the unique opportunity of the 2008 global financial crisis, which is used to investigate the rationale for corporate hedging decisions in differing macroeconomic conditions: before a financial crisis, during a financial crisis and after a financial crisis.

In the second empirical chapter of this thesis, we analyse the impact of corporate hedging on firm performance. Several empirical studies have been conducted to ascertain the effect of hedging on firm performance. With the exception of Fauver and Naranjo (2010) and Allayannis et al. (2012), most of the existing studies examine the unconditional effect of hedging on firm

[3] See Appendix 2.1 for evidence of tightened bank loans during the 2008-2009 financial crisis period.

performance by suggesting that the impact of hedging on firm performance is direct (e.g. Allayannis and Weston 2001; Bartram et al. 2011; Carter et al. 2006a & b; Haushalter 2000; Jin and Jorin 2006 to mention a few). However, some extant literature argues that the efficiency of a corporate policy including derivatives usage may depend on organisational factors and the external environment in which firms operate (Allayannis et al. 2012; Hutchinson and Gul 2004; Wu 2008).

Drawing from the effect of the organisational environment in which firms operate, this chapter attempts to extend the literature on the implications of hedging by addressing two distinct research questions. The first research question we explore is: what is the impact of corporate hedging-ownership structure on performance? The intuition of this study is different from those presented in the Fauver and Naranjo (2010) and Allayannis et al. (2012) papers. The arguments of Fauver and Naranjo (2010) and Allayannis et al. (2012) stem from the value that the market places on firms with good ownership structure, which we call ‘‘the market perspective of hedging-performance relation’’. They argued that because of asymmetries of information between a firm and potential fund providers, the market may rely on the corporate governance that is in place to understand firms' motives for hedging, and thus would place a high value on firms with good governance. The main idea of our study is focused within the firm. We concentrate on how ownership structure may affect the association between hedging and performance: mainly through the decisions and actions of the owners that are within the firm. Thus, we call this, ‘‘the within firm view of hedging-performance relation’’. In the presence of agency problems between insiders and shareholders, proponents of the alignment theory argue that insiders' share-ownership may align the interest of insiders with those of shareholders to the extent that insiders would pursue value-maximising policies (Jensen and Meckling 1976). Also, advocates for the monitoring hypothesis argue that firms with high institutional investors may be better monitored to the extent that management may be influenced to pursue value-enhancing policies. Taking together the alignment and monitoring arguments with that of corporate hedging, we argue that if ownership structure can reduce agency problems between insiders and shareholders, then the effect of hedging on performance may be weakened in firms with high managerial and high institutional ownerships. Lastly, the study addresses the question, which type of managerial (institutional) shareholders really affects the relation between hedging and firm performance? According to past studies, institutional investors with fewer

business relations may have greater incentive to influence management to activities that would enhance performance (Cornett et al. 2007; Ferreira and Matos 2008).

The chapter is motivated by the rise in the number of firms that reported tremendous decline in their performance between 2013 and 2014. About 299 of FTSE-350 firms issued performance warnings in 2014 alone, compared to about 255 in 2013, and they attributed the decline in performance to their exposure to market risks e.g., fluctuations to currency exchange (Smith 2015; Watkins 2015). This revelation motivates the study and raises very pertinent questions. Among the more relevant and direct ones are: do UK firms manage their exposure with financial derivatives? If they do, then, what is the impact of derivatives use on their performance? Also, the chapter is motivated by the current state of empirical studies in that much of the extant literature examines the unconditional impact of hedging on performance, without taking into account the organisational and external environmental factors in which firms operate. Studies that examine the unconditional impact of hedging may produce results that are noisy, and may have wrong assumptions and interpretations of findings (Allayannis et al. 2012; Hutchinson and Gul 2004; Wu 2008).

Lastly, in the third empirical chapter of this thesis we examine the factors that induce firms to be financially conservative. The main objective of this chapter is to holistically investigate financial conservatism by analysing different types of leverage conservative policy, from low-leverage policy to the most extreme form of conservatism, i.e., zero-leverage. In doing so, the chapter focuses on four main research questions. First, does financial constraint influence firms' decision to be financially conservative? According to the financial constraints hypothesis, some firms may find it difficult to access the debt markets to obtain sufficient funds to finance valuable projects in the presence of capital market imperfections, and would therefore be financially conservative. Second, does underinvestment induce firms to follow financial conservatism? The underinvestment theory suggests that high-growth firms may follow a conservative leverage policy to reduce the conflict of interests between shareholders and debt-holders (Myers 1977). Third, what role does corporate ownership structure play in financial conservatism decision? Lastly, does corporate hedging play a role in firms' decisions to be financially conservative? It is argued that macroeconomic conditions may affect capital structure decisions (Antoniou et al 2008; Erel et al 2012; Korajczyk and Levy 2003). Dang (2013) reports that some firms may not be able to access the debt market due to inconducive macroeconomic conditions, and thus may be conservative. Considering the positive association

between financial distress costs and volatility, Bessler et al. (2013) report that firms may follow a conservative leverage policy when there is an increase in business risk. Then, corporate hedging literature argues that firms that hedge may be able to reduce cash-flow volatility and financial distress costs, as they may have easy access to credit markets to meet obligations because the market believes they are less likely to violate financial covenants (Campello et al. 2011; Disatnik et al. 2014; Froot et al. 1993; Smith and Stulz 1985).

In recent years, financial conservatism has become a common phenomenon among firms, whereby firms maintain a substantially lower leverage than is predicted by prominent capital structure theories, and some firms even go to the extreme by not having debt in their capital structures (Graham 2000; Korteweg 2010; Lemmon et al. 2008). The two dominant capital structure theories indicate that firms would use debt to enable them to meet their financial obligations. For instance, the trade-off theory of corporate capital structure suggests that firms carefully weigh the benefits of debt financing against agency costs and the costs of financial distress to ensure that they do not deviate from their optimal level, and in so doing, avoid the negative consequence of facing reduced risk-adjusted returns or even possible failure (Jensen and Meckling 1976; Kraus and Litzenberger 1973). The pecking-order theory suggests that features of imperfect capital markets, such as information asymmetry, may induce firms to prefer debt financing rather than equity, which may be more sensitive to mispricing when their internal resources are insufficient to finance valuable projects (Myers 1984; Myers and Majluf 1984).

Since there are benefits to being levered, an increasing number of studies have examined the reasons why firms may abstain from debt. Some studies investigate the determinants of financial conservatism policy (e.g. Bigelli et al. 2014; Iona et al. 2007; Marchica and Mura 2010). These studies focus on the combination of low-leverage and cash-holding and thus, do not holistically dwell on the puzzling leverage conservatism phenomenon. Other contemporary studies position their analysis by examining a specific aspect of leverage conservatism policy (e.g. Bessler et al. 2013 and Dang 2013 focused on motives for zero-leverage policy), while another line of studies that investigate the zero-leverage phenomenon only give brief attention to low-leverage policy (Byoun and Xu 2013; Minton and Wruck 2001; Strebulaev and Yang 2013). The argument that is always presented in the literature is that the study and understanding of the reasons for zero-leverage policy would provide insight into the reasons why firms adopt a low-leverage policy (Korteweg 2010; Strebulaev and Yang 2013). In our

opinion, this is too ambiguous an assertion, as it is possible that the characteristics of firms with zero-leverage policy and those with low-leverage policy are different (Byoun and Xu 2013). Also, there is a possibility that some low-leverage firms have optimal behaviour, and as such they may be able to operate and survive for many years without being targeted for acquisition (Chung et al. 2013), while it may not be so in the case of zero-levered firms.

1.2: Dataset and Methodology

1.2.1: Dataset

To conduct the research, we randomly select our sample which includes the non-financial firms that are listed on the FTSE (Financial Times Stock Exchange) All-Share index in the London Exchange. We exclude firms that are in the financial and utility sectors because firms in these sectors are highly regulated and their financial and accounting information may be reported differently. Also, the financial firms are market makers in the derivative markets. We collect our financial and accounting dataset from the Datastream and Thomson One databases. In addition, we collect by hand, detailed information on the hedging policies adopted by each firm, focusing on the financial derivatives instruments. The chapter focuses on the derivatives instruments that firms employed mainly for hedging purpose for two main reasons. First, it is sometimes difficult to observe and decide whether firms used the other strategies for reasons other than managing risk (Nance et al. 1993). For example, unless it is clearly stated, it may be somewhat difficult to know the reason behind a firm's diversification into another geographical region as such moves may be initiated to exploit international business. Second, following the International Financial Reporting Standards (IFRS) mandate of 2005, requiring non-financial firms to report their derivatives use, information regarding the use and purposes of individual firms' derivatives use can now be obtained, although it is only available in the annual financial statement of each firm. We define hedging as a dichotomous variable that takes the value of 1 if a firm reports the use of foreign exchange, interest rate and/or commodity derivatives and 0 if otherwise. We also considered using continuous measures of derivatives usage. However, we observe that firms do not report their outstanding derivatives positions in the same way, as some firms carry forward their previous year outstanding, which may create noise for our analysis. We use the terms corporate hedging and derivative instruments interchangeably.

Furthermore, we rigorously source and collect by hand detailed information about the ownership structure of our sampled firms from the Thomson One Banker website, and use the information to create several ownership variables, which include the equity ownerships of board of directors, and institutional investors. In the first stage of the data collection, we hand-collect the names of all the directors (i.e., executive directors and non-executive directors) in each firm in each year, as well as their office. In the second stage, we hand-collect a list of all the shareholders in each firm as well as their shareholdings. In the next stage, we arrange and match the names of the board of directors with the list of the shareholders in each firm as well as their equity ownership, in each period. Subsequently, we categorise the executive members of the board into the chief executive and chief finance officers, and other executive director to enable us to examine the impact of the chief executive and chief finance officers' equity-ownership on hedging decisions. It is argued that the shareholdings of the chief executive officers and chief finance officers influence their firms' financial policies. For instance, it is shown that CEOs' share-ownership affects firms' leverage level, while CFOs' shareholding is related to debt-maturity choices (Chava and Purnanandam 2010; Coles et al. 2006).

In addition, we hand-collect information about the equity ownership of institutional investors, which includes the ownerships of independent institutional investors and those of grey investors. Previous studies argued that independent investors have greater incentives to monitor and influence managers to ensure that value-maximising strategies are implemented than grey investors, because they have fewer business ties with the firms they invest in (Almazan et al. 2005; Brickley et al. 1988; Chen et al. 2007; Ferraira and Matos 2008). As done with insiders' equity, institutional ownership data are collected in stages. In the first stage, we collect the list of all the shareholders that are in each firm as well as their shareholdings. In the second stage, we exclude the strategic[4] investors and their shareholdings from the list of all shareholders.

1.2.2: Methodology

In Chapter 2, we first explore the effects of firm characteristics on hedging decisions for the sample period, 2005-2011, by conducting pooled logistic regressions. This provides a basis for comparison with previous studies. In particular, we investigate the effects of financial distress costs, underinvestment costs, agency costs, and ownership structures on corporate hedging

[4] The investor types are based on Thomson One Banker investors' classification.

decisions. The sample period begins in 2005 because the IFRS requires non-financial firms starting from 2005, to report their hedging activities by documenting information about their derivatives usage and their positions. Then, we classify the sample period into three sub-periods based on the prevailing macroeconomic conditions: pre-crisis (2005-2007), during a financial crisis (2008-2009) and after a financial crisis (2010-2011)[5], to enable us to investigate the factors that influence firms' decisions to hedge during the different periods.

In Chapter 3 of the thesis, which explores the impact of hedging, we first model the unconditional implication of hedging on performance. This affords us the opportunity to compare our findings with existing studies. However, by relating the effects of hedging directly on performance, our estimation is faced with some econometric issues – endogeneity problems. For example, it is argued that the observed correlation between hedging and firm performance may be a reflection of an association between two endogenous variables, as there might be a causal association between them (Jin and Jorion 2006). For instance, if on the one hand, hedging stabilises cashflow volatility to the extent that a firm has easy access to external finances to undertake investments, the firm may have improved performance. On the other hand, a positive performance may motivate a firm to carry out hedging activities to protect its cash-flows.

To address the potential issues relating to endogeneity problems and model misspecifications, the chapter adopts two distinct methods. Firstly, following past studies such as Cornett et al. (2007) and Lel (2009), we assume that firm performance at time *t* is a function of the policies made at time *t-1*. Cornett et al. (2007) argue that the effects of prior year change in firm ownership structure may not be observable in the performance of that same year, but may be observable in the performance of the following year. Thus, they argue that lagging the explanatory variables by one year may mitigate potential endogeneity problems that may arise due to simultaneous effect. Based on these understandings, we estimate performance at time *t* against explanatory variables that are lagged by one year. Secondly, we introduce exogenous variables to our models that enable us to examine the conditional implication of derivative usage on firm performance. It is argued that the association between hedging policies undertaking by a firm and the firm's performance may depend on the activities of the management, who may be ''acting for personal utility maximisation purposes'' (Jin and Jorion

[5] See Appendix II for justifications for period classification.

2006: p915). Thus, we introduce several measures of ownership structure to serve as exogenous variables. Further, to deal with the identified and any potential endogeneity problems, we use four different estimation methods. First, we estimate two different types of cross-sectional performance models: the annual average cross-sectional regression and pooled average cross-sectional models. Second, we estimate a standard pooled ordinary least square regression model, and lastly we employ random effects models. Finally, the chapter analyses the joint effects of hedging and ownership structure on firm performance by modelling performance equations on four different sub-samples: high and low board of directors' shareholdings, as well as high and low institutional investors' shareholdings.

In Chapter 4 we explore the motives behind financial conservatism policies. Following past studies, we define a firm as being conservative if its leverage ratio is lower than is predicted by any of the prevailing capital structure theories or, in the extreme case, if the firm does not carry any debt at all (Byoun 2013; Dang 2013; Frank and Goyal 2005; Graham 2000; Miller 1977; Strebulaev and Yang 2013). To identify whether a firm follows a leverage conservative policy or not, we carry out the task in stages. In the first stage, we estimate a leverage model that takes into account financial constraint, investment opportunities, asymmetric information and profitability. In the second stage, we use the fitted values obtained from the regression to compute the annual optimal leverage level for each firm. In the third stage, we compute the leverage level for each industry that is in our sample. It is noted that while it is possible that some unprofitable firms may have a higher leverage level than optimal, it may be very unlikely for them to have higher leverage than other firms in their industry (Ozkan 2001). Thus, in the final stage, we use two criteria to identify conservative firms: the actual leverage that a firm has must be lower than both the optimal and industry average. In so doing, the study identifies four different types of conservative firms: low-leverage firms are firms with actual leverage level lower than both the optimal and industry average; nearly low-leverage firms are firms with a leverage level that does not exceed 5 per cent of both the optimal and industry average; nearly zero-leverage firms are firms with a leverage level that does not exceed 1 per cent of both the optimal and industry average; and lastly, zero-leverage firms are firms that do not have any outstanding debt in a given year. For each classification of financial conservatism, we assign the value of 1 to a firm that satisfies both conditions and 0 otherwise. As the study uses a dichotomous dependent variable, we estimate several pooled logistic regressions to investigate firms' motive for adopting each conservative policy.

1.3: Main Findings and Contributions of Chapters

1.3.1: Main Findings

Our analyses provide several important findings that enhance our knowledge on the factors that influence hedging, leverage conservatism decisions as well as the implications of hedging. In Chapter 2, we explore the rationales for corporate hedging and show that expected costs of financial distress, underinvestment problems, size, foreign currency exposure, as well as institutional investors' holdings, particularly the holdings of independent investors, significantly influence hedging decisions. When we consider the rationales for hedging in the analysis for different sub-periods, we find that the factors that induce hedging decisions as well as the economic impacts of the factors differ depending on the state of the macroeconomic environment. We find that expected costs of financial distress have lower economic effects on hedging decisions in periods before the financial crisis than during or after the financial crisis. The findings are possibly evidence that leverage is counter-cyclical, as firms prefer equity to debt financing during economic growth (Choe et al. 1993; Graham et al. 2011; Korajczyk et al. 1990). By implication, then, expected costs of financial distress may be lower, which induces a lower probability of hedging. This finding is consistent with the argument that financially distressed firms have greater propensity to hedge during a financial market meltdown (Almeida et al. 2004). The analysis also shows that there is a positive association between tax liability and the propensity to hedge in the three macroeconomic conditions. However, the association is significant only during the financial crisis. This is consistent with the explanations that there is a correlation between tax liability and financial constraints, and that financial constraints may be severe during a financial crisis (Fazzari et al. 1988), and thus firms may be more likely to hedge at such a time.

Regarding the effect of ownership structure on the probability of hedging, we argue that, while institutional owners have better incentives than other shareholders to gather information about firms, which may then be used to effectively monitor and influence management decisions, effective monitoring and influencing of management policies may be significant in tranquil macroeconomic conditions only. This is because there may be better accuracy about the information that is gathered, as well as its interpretation. The findings show that institutional owners have positive impact on the likelihood of hedging; however, the impact is significant

in the period before the crisis only. This finding provides evidence that institutional investors in the UK do not only effectively monitor the activities of the management, they also influence management to make decisions that maximise firm value. In addition, our analysis suggests that the holdings of independent institutional investors have significant positive impact on the decision to hedge in the pre-crisis period, which is consistent with the view that institutional investors that lower monitoring costs actively influence management decisions to maximise value, due to their fewer business ties with the firm. Overall, the analysis of this chapter suggests that the rationales for hedging policies differ depending on the state of the macroeconomic environment.

In Chapter 3, which examines the impact of hedging on firm performance, we find consistently in all our econometric specifications that hedging policies of UK non-financial firms have a negative impact on performance, although the coefficients are not significant. This finding is not in line with hedging theories. However, it supports the arguments presented in some prior studies that the financial risk created by hedging in the form of hedging costs may increase financial constraints and the expected costs of financing, and thus, reduce firm value (Mello and Parsons 2000). Also, contrary to the arguments presented in previous literature (such as Goergen and Renneboog 2001) that institutional investors in the UK play a passive role in the firms that they invest in, we find a positive relation between the holdings of institutional investors and firm performance, which suggests that institutional investors in the UK monitor and exert influence on corporate decisions. In addition, we find evidence that the percentage of shares held by firm insiders (the executive directors, non-executive and CEO_CFO) has positive effects on performance. These findings provide support for the alignment hypothesis. Lastly, regarding the investigation relating to the joint impacts of hedging and ownership structure on performance, we find that the effect of hedging on the performance of firms with high board of directors' (institutional) ownership is difference those with low board of directors' (institutional) ownership. Specifically, we find that the effect of hedging on the performance of firms with high board (institutional) ownership is weaker than in firms with lower board (institutional) ownership. We interpret this to mean that there is no performance benefit associated with the use of derivatives when ownership structure is high. The findings are in line with our argument that hedging plays no important positive role in firms that have higher institutional and insiders' share-ownerships. Lastly, although hedging does not have positive effects on our sample's performance, we observe that institutional investors that have fewer

business relations with a firm (i.e., grey investors) actively monitor and influence firms' decisions to make decisions that induce good performance, as we find a positive association between the holdings of grey investors and firm performance.

In Chapter 4 the study records several findings. First, we find that leverage conservative firms are not all the same. Specifically, firms that follow a low-leverage policy are larger, have fewer growth opportunities and use more financial derivatives than firms that are nearly low-levered, nearly zero-levered and zero-levered. Also, low-levered firms have smaller cash balances, less investment in capital expenditure and the highest independent investors' shareholdings. The findings suggest that the activities of low-levered firms may be monitored and influenced by independent investors; hence, they may not face substantial agency problems or have significant debt financing restrictions like other conservative firms. The zero-levered firms, on the other hand, are the smallest with considerably more valuable growth opportunities, hold large cash balances and use fewer derivatives compared to the low-levered, nearly low-levered and nearly zero-levered firms. These findings partly explain why they avoid debt, as very small firms are more likely to be credit constrained (Hadlock and Pierce 2010). Further, we find that the zero-levered firms have the highest percentage of insider shareholders.

Second, we find that the percentage of firms that follow conservative leverage (for the four types of leverage conservatism) policies falls during the financial crisis from what it was prior to the crisis and subsequently increases again after the crisis. This finding indicates that leverage conservatism might be pro-cyclical. Next, on the investigation of the role of derivatives usage on leverage conservative policies, we find evidence in support of our argument, that firms that use derivatives to hedge do not have the incentive to adopt leverage conservative policies, particularly low-levered and nearly low-levered policies. In sum, in line with our hypothesis, financial constraints and derivatives usage significantly induce a firm's decisions to follow conservative (LL, NLL, NZL and ZL) policies. On the other hand, underinvestment contributes to the NLL, NZL and the ZL decisions but not the LL decision.

The overall conclusion of the analysis conducted in this thesis is that corporate hedging, as it concerns capital market imperfections, matters. There is evidence that firms hedge more during the financial crisis than in normal macroeconomic periods. Specifically, our analysis reveals that increase in the probability of encountering financial distress costs, as proxied by tax liability and leverage, induces firms to hedge during financial crisis compared to tranquil

macroeconomic conditions. These imply that, while hedging may matter at all times, the factors that make firms hedge are not the same under different macroeconomic conditions. Regarding the joint effects of corporate hedging and ownership structure on performance, the analysis reveals that hedging has a negative effect on firm performance, and hedging firms with high ownership structure are worse off. The findings are inconsistent with the view of the existing hedging theories; however, they support the intuition of our study that if a firm has a mechanism in place that can reduce capital market imperfections, it might not be necessary to hedge, as the market may perceive the hedging as wasted activity, and in so doing reduce the value placed on such firm. Further, our analysis shows that corporate hedging matters when firms decide whether to adopt financial conservatism policies or not, as we find strong evidence that hedging has a negative impact on conservatism policies. The implication of the finding is that since hedging can mitigate cash flow volatility, hedging firms may have easy access to debt market through low cost of capital, and in so doing may be able to issue more debt. Also, the study indicates that institutional investors, particularly independent investors, are active in the UK, in that they participate in the decisions made by management either in hedging or leverage conservative policies, as well as ensure that management follow value-enhancing policies.

1.3.2: Contributions

The empirical analysis conducted in this study provides several contributions to knowledge, to the extent that we show that hedging activities matter in corporations, with regard to the determinants of corporate hedging, implications of hedging, and the determinants of leverage conservatism policies. This thesis contributes to knowledge by examining the effects of the different types of institutional owners on hedging policy. Also the study benefits from the unique opportunity to employ a sample period that provides natural experience of a financial crisis. In Chapter 2, the empirical analysis is conducted separately for three sub-periods, to investigate whether the incentives for corporate hedging are affected by a macroeconomic shock. To the best of our knowledge, the analysis done in this chapter is the first attempt to empirically investigate whether the rationales for hedging differ depending on macroeconomic conditions. To corporations and academia, the study provides findings that suggest that hedging incentives are not similar across the macroeconomic states.

In Chapter 3, we contribute to knowledge, in that we show how corporate financial policy such as hedging impacts performance. We test and present a different argument from that offered in

existing hedging literature by emphasising that the efficiency of financial policies depends on the organisational and environmental context in which firms operate. In addition, we implicitly relate the effect of hedging to the cost of engaging in the activity. By taking together the arguments of the alignment, monitoring and hedging theories, we argue that ownership structure that is able to reduce agency problems may be able to reduce the effect of corporate hedging on firm performance. This is because the extent to which ownership structure mitigates agency problems could move a firm gradually away from enjoying the benefits of using derivatives. The ways in which we have conducted the study help provide further insights into risk management policies for firms and investors. Furthermore, the chapter contributes to the existing literature in respect of our model specifications, which are rich in dealing with endogeneity problems. We effectively control for the endogeneity problem that may arise in our examination of the unconditional impacts of derivative usage on firm performance by first introducing firm ownership structure variables into our estimations to serve as exogenous variables, and then estimating several partial dynamic performance equations using firm performance at time *t* as a function of the explanatory variables at time *t-1*. To the best of our knowledge, this is the first study in the area of derivatives usage and firm performance that assumes that current year performance is a function of prior year activities. In addition, this is the first study on corporate hedging that employs average values to compute variables to address endogeneity issues.

In Chapter 4, we provide additional insight to knowledge on capital structure and make distinct contributions in several ways. The first important contribution we make is that we emphasise the role of a firm's optimal leverage level in identifying whether a firm is conservative or not. We take into consideration the fact that some firms may have a low level of debt and still have sub-optimal behaviour, and thus do not assume that all firms that carry low leverage have optimal behaviour. This is because such an assumption may have serious implications for the classification of our conservative firms as well as affect our interpretation of results, as it may make no economic sense to study a leverage level that is sub-optimal in the first place. Second, the conservative firms in our sample are carefully classified having taken into account very important factors like asymmetric information, profitability and financial constraints as well as industry average. Next, this chapter does not assume that all leverage conservative policies are homogenous (Korteweg 2010; Strebulaev and Yang 2013). This leads us to examine the determinants of four different classes of leverage conservative policies, namely, low-leverage,

nearly low-leverage, nearly zero-leverage and zero-leverage. To our understanding, studying the different types of conservative policies broadens our overall knowledge on why firms follow each conservative policy. Lastly, this chapter contributes to knowledge in the scope of our investigation, which examines the role that hedging plays in firms' decision to be conservatively levered. To the best of our knowledge, this is the first study that relates corporate hedging with leverage conservatism behaviour.

The overall implication of this thesis is that future research that examines the implication of corporate hedging should take into account other mechanisms that may be in place in a firm to draw conclusion on the value-maximisation effect of corporate hedging. Also, corporations should carefully consider their hedging strategies before they implement them. Corporations should note that having the incentives to hedge do not always imply that hedging activities would maximise firm value. Thus, finance or treasury managers should take note of any other mechanisms (such as ownership structure) that may be in place, which may impede the value maximisation objective of hedging or work in the same way as hedging, as it relate to reducing the negative impact of capital market imperfection. This is because, if there is an alternative mechanism already in place in the firm, engaging in corporate hedging activities is unnecessary and the impact of corporate hedging will be reduced or will be insignificant. In addition, firms should carefully weigh the benefits expected from hedging activities against the cost of implementation. This is because, if hedging is a costly activity for the firm, then the market can see that the firm is bearing unnecessary cost and thus, reduce the value that is placed on the firm.

CHAPTER 2: THE DETERMINANTS OF CORPORATE HEDGING

2.1: Introduction

The financing and investment activities of firms are exposed to several risks and uncertainties. For example, the costs of and ability to access external financing are positively associated with cash-flows, which in turn, may increase the sensitivity of investment to cash-flows (Fazzari et al. 1988; Hovakimian and Hovakimian 2009; Minton and Schrand 1999). In the presence of severe cash-flow volatility, the values of dividend pay-out and cash-holdings may become higher. For instance, firms with high cash-flow volatility may increase their cash holdings in the presence of financial constraints. In effect, the action of the firm may worsen the agency problem that exists between managers and shareholders (Han and Qiu 2007; Jensen 1986). In the presence of agency problems, managers have a higher possibility of expropriating the shareholders by diverting fewer funds to positive NPV projects to enable them to consume perquisites rather than serve the interest of shareholders. In addition, shareholders may demand that a greater fraction of available cash flows be distributed as dividend if it is difficult to accurately ascertain the reasons for high variability in cash-flow (Bradley et al. 1998).

To safeguard cash flows against fluctuations and to limit the severity of the impact of uncertainty, firms engage in risk management activities (Froot et al. 1993; Mian 1996; Stulz 1996; Smith and Stulz 1985). In view of these, hedging theories suggest that derivatives usage mitigates the likelihood of lower-tail realizations; thereby providing firms with expected financial distress costs a greater incentive to hedge (Stulz 1996; Smith and Stulz 1985). Also, it is argued that firms with valuable projects have a greater incentive to hedge, in the presence of costly external financing, to ensure they have enough internal funds to undertake projects, thereby avoiding costly external financing (Froot et al. 1993). Further, it is argued that persistent negative increase in macroeconomic uncertainty may have ripple effects in firms and financial markets at large, to the extent that there may be increased adverse selection and moral hazards which may lead to change in corporate decision making as well as hindrance to the central functions of financial markets (Haddow et al. 2013; Hoque 2013; Bernanke and Gertler 1989). This is because some firms may, for example, find it extremely difficult to access

external financing due to severe credit crunch, and in so doing, managers may find it difficult to anticipate the outcome of their actions or how the changes they make to their firm financial policies affect their firms during a crisis (Baum et al. 2006; Duchin et al. 2010). Taking the above explanations together, the question then is: what factors influence firms' decisions to hedge, in general? And do the factors that induce firms to hedge change depending on prevailing macroeconomic conditions: before a financial crisis, during a financial crisis and post-financial crisis? The main purpose of this empirical chapter is to provide answers to these questions.

These questions are very important at this time, particularly in a country such as the UK, which has one of the most efficient capital markets and well-developed derivatives markets in the world (Zhou and Wang 2013). The world economy plunged into severe financial crisis in mid-2007, which increased the business risks of most firms through its impact on credit markets. Using the natural experience of the financial crisis and the UK's non-financial firms, we can explore better the factors that make firms hedge during tranquil macroeconomic periods as well as during a financial crisis, considering that the UK firms have close proximity and access to external capital (Bartram et al 2009; Haddow et al. 2013). Moreover, it is argued that the difference between firms that survive financial distress and those that file for bankruptcy during macroeconomic uncertainty is in the risk management policies undertaken (Sabbadini and Lim 2011). In recent times, the number of UK firms that experience financial distress is increased to the extent that about 4,001 firms filed for voluntary and compulsory liquidations in June-September 2008 in England and Wales alone, compared to 206 bankruptcy instances in the whole of the UK in 1965-2002, according to Insolvency Service reports (Bhattacharjee et al. 2009).

Although there are several ways in which firms could manage their risks, such as using insurance, securitisation, diversification, and by operational hedging, this chapter focuses on corporate hedging by way of financial derivative instruments. Specifically, we are interested in investigating the factors that make firms use derivatives to hedge their cash-flow risks. We follow this path for two main reasons. First, it is sometimes difficult to observe and decide whether firms use other strategies for reasons other than managing risk (Nance et al. 1993). For example, unless it is clearly stated, it may be somewhat difficult to know the reason behind a firm's diversification into another geographical region; as such moves may be initiated to exploit international business. Second, following the IFRS (International Financial Reporting

Standards) 2005 requirement that non-financial firms report their derivatives use, information regarding the use and purposes of individual firm derivatives use can now be sourced and obtained, although it is only available in the annual financial statement of each firm.

Our rationale for examining whether the reasons for corporate hedging strategy during a financial crisis differ from those in years prior to a financial crisis is that an intense macroeconomic shock may impose additional risks on both the business environment and the cash flow of firms. For example, market risks: foreign exchange, interest rate and commodity risks become more intense. An instance of such an effect is the sharp decrease in the volume of new loans in the U.S market during the 2008 financial crisis, which was attributed to a fall of about 6.4 per cent in corporate investment in the same period (Duchin et al. 2010; Ivashina and Scharfstein 2010). Further, Arslan et al. (2006) and Almeida et al. (2004) suggest that firms take their hedging policies more seriously during financial crisis than in normal macro-economic states and therefore are more likely to change their hedging policies when there is severe cash-flow fluctuation occasioned by unfavourable macroeconomic conditions. Despite the array of evidence that suggests that firms might be influenced to hedge under different macroeconomic conditions, there is yet to be a direct empirical study on this. On this basis, our study is motivated to use the natural experience of the 2008 financial crisis to fill the gap in the literature.

To conduct our investigations, we draw our sample from the non-financial firms quoted on the FTSE All Share over 2005-2011. The study period starts from 2005, because prior to 2005, disclosures of information about corporate derivative usage were on a voluntary basis and as such most firms chose not to make public such information. However, following the IFRS 2005 declaration, firms are mandated to make reports about their hedging activities in their annual financial reports. We measure derivatives usage as a binary indicator that takes the value of 1 if a firm hedges with foreign exchange, interest rate and/or commodity derivative instruments and 0 otherwise. We also considered a continuous measure of derivatives usage. For instance, we attempted to measure derivatives usage by the hedge ratio of the contracts entered into by a firm to manage risk exposures. However, this information is not available. Berkman and Bradbury (1996) attempted to use the same data but were unable for the same reason. Further, we attempt to follow Berkman and Bradbury's (1996) proxy for hedging activities by using the ratio of the notional outstanding values of all derivatives at balance sheet date to the market

value of the firm[6]. However, we observe that there is no uniformity in the way and manner in which firms report their outstanding derivatives, as some firms carry forward their previous year outstanding, which may create noise in our analysis. This is because the net balance in a year might reflect not only the hedging that was carried out in that year.

Using the logistic regression analysis, we investigate the firm-level factors that motivate derivatives usage, over 2005-2011. We document some findings. First, we find that about 64 per cent of UK firms' hedge with derivatives in 2008. This is comparable to about 55.17 per cent users in 2005. Second, we find that derivatives users are larger, more levered, have more tax liability and intangible assets than non-users, which is consistent with the expected costs of financial distress. Also, derivatives users have more spending on capital assets and tangible capital, and have greater intangible assets than non-users, which is in line with the underinvestment costs explanation. Furthermore, we find that hedging firms have a higher percentage of institutional owners and fewer insider owners than non-users. We then proceed to investigate the incentives for corporate hedging under three different macroeconomic conditions: the period before a financial crisis (2005-2007), during a financial crisis (2008-2009) and after the crisis (2010-2011).

The justification for our sub-sample periods is based on the BIS reports. According to the BIS reports, the global GDP growth fell from about 4.8 per cent in 2007 to almost 1.28 per cent in 2008; also, the financial markets were tightened around the world to the extent that it was costly for many non-financial firms to access debt (see Appendix 2.1.a and 2.1.b respectively). Our analysis reveals several important findings. First, the expected costs of financial distress, exposure to foreign exchange risk, and size significantly influence firms' decisions to hedge, irrespective of the prevailing macroeconomic conditions. However, the marginal effects of the factors differ in the different situations. Second, we find that tax liability has a significant positive effect on a firm's propensity to hedge during the financial crisis period only. Also, we find that institutional investors, particularly investors that have fewer business ties with firms, have greater incentive to influence firms' decisions to reduce volatilities through hedging.

This chapter contributes to the literature on corporate hedging in several ways. We use new information about firm derivatives usage and ownership structure over 2005-2011 that covers

[6] Other continuous measures of derivatives usage used in previous studies include; the notional amount of a firm's derivatives position at year end divided by total assets (Gay and Nam 1999).

three different macroeconomic conditions: pre-financial crisis, during the financial crisis. These data afford us the opportunity to investigate whether the factors that create incentives for firms to engage in hedging strategy during the three sub-periods are different. To the best of our knowledge, this is the first study to use a global financial crisis to conduct such investigation. To the extent that we carry out the analysis of this chapter in three sub-periods, we contribute to knowledge by showing that the factors that induce hedging during the periods are not the same.

The rest of the chapter proceeds as follows. In Section 2, we present extant hedging literature in order to develop testable hypotheses. Section 3 discusses the methods, sources of data, defines and describes the variables that are used in our analysis. In section 4, we present the empirical results. Sections 5 and 6 contain the robustness tests and sensitivity analysis and in section 8, we conclude.

2.2: Literature Review and Development of Testable Hypotheses

In this section, we review some existing literature on the determinants of derivatives usage. Also, we explore arguments for the development of our main hypotheses as well as discuss several variables that are used in the empirical study.

2.2.1: State of hedging literature

The theoretical literature on corporate hedging suggests that market imperfections such as expected financial distress costs, underinvestment problems, taxes, informational asymmetries and agency problems create incentives for firms to hedge with derivatives (Breeden and Vismanathan 1996; DeMarzo and Duffie 1991; DeMarzo and Duffie 1995; Froot et al. 1993; Myers 1977; Smith and Stulz 1985; Stulz 1996). For example, Smith and Stulz (1985) argue that the likelihood of financial distress creates an incentive for firms to hedge to mitigate cash-flow volatility. Also, they argue that the convexity of tax function to income may influence a firm to hedge to reduce expected tax liability. Froot et al. (1993) propose that asymmetric information between firms and outside investors may motivate firms that face difficulties in accessing external financing to hedge to ensure that that they have sufficient funds to finance valuable projects.

Earlier empirical work has explored several aspects of the hedging theory. Mian (1996) examines the effects of financial distress costs, tax and underinvestment problems on the probability that a firm would hedge. Using a sample of 3022 US firms, he finds no evidence that expected costs of financial distress and underinvestment problems motivate firms to hedge. Further, he reports weak evidence that income tax influences firms' decisions to use derivatives. Also, Geczy et al. (1997) examine the determinants of currency derivatives using a sample of firms from *Fortune 500* for year 1990. They find that firms with high-growth opportunities and tighter financial constraints have a high tendency to use currency derivatives. Further, they document that the expected costs of financial distress have weak effect on a firm's propensity to hedge, as they find a positive but statistically insignificant effect of long-term debt on hedging decisions. In addition, Purnanandam (2008) examines whether *ex post* financial distress costs influence a firm's hedging decision. He argues that the probability of encountering financial distress and the expected loss of defaulting are increasing functions of the life of a firm's assets; thus, to the extent that the probability of financial distress and expected loss of default increase, a firm may be more likely to hedge. Using a sample of 2000 US firms for 1997, Purnanandam (2008) finds strong evidence that expected costs of financial distress motivate firms to engage in hedging activities. He also finds support for size motivation for hedging.

A strand of study examines the determinants of derivatives usage by focusing on industry-specific context. For example, Choi et al. (2013) investigate the impact of information asymmetry on the hedging decisions of US pharmaceutical and biotech firms. They argue that investment in new product development (R&D intensity) creates high growth opportunities for pharmaceutical firms. However, the uncertainty of the success of the process creates a source of information asymmetry that may make external financing costly and may induce the firms to hedge. In a logistic regression model, they find R&D and advertising intensities have positive and significant association with derivatives usage, which suggests that firms that have information asymmetry have a high propensity to hedge to mitigate underinvestment problems.

Another line of literature provides international evidence of the rationales for firms' hedging decisions. For example, Bartram et al. (2009) examine the derivatives usage of 7319 firms from 50 different countries, and document that country-level factors, such as legal systems, are not very important determinants in firms' hedging decisions. Nevertheless, they find that the presence of an effective large derivatives market has a positive effect on firms' hedging

decisions. They conclude that firms in a less liquid derivatives market may hedge to limit the severity of the economic downturns that may occur in developing countries. Lel (2012) investigates the effects of corporate governance structure on a firm's motive for using currency derivatives. Using a sample of firms from 30 different countries over 1999-1999, she reports that firms with weak governance use derivatives for managerial reasons, while firms with strong governance use derivatives to mitigate costly external financing.

While earlier empirical studies have examined the incentives for corporate derivatives usage, tests on the implications of ownership, particularly tests based on the type of institutional investors, are still very limited. Also, earlier studies have paid little attention to examining whether the incentives for derivatives usage differ relative to the prevailing macroeconomic conditions. In this chapter, we extend the existing literature by (1) testing the effects of ownership structure (2) examining whether factors that make firms use derivatives in a tranquil macroeconomic environment differ from those that make firms use derivatives during a financial crisis. In the next subsection, we discuss the basic hypotheses that we test in this chapter.

2.2.2: Development of testable hypotheses

In this section, we formulate the basic hypotheses that we test on the rationales for derivatives usage.

2.2.2.1: Probability of financial distress

The cash-flow of a levered firm may be volatile, which may accentuate the expected costs of financial distress, and as such, firms may find it substantially difficult to meet financial obligations such as payment of principal and interest under loan agreements, payment of debts to suppliers or adherence to debt covenants (Smith and Stulz 1985; Wruck 1990). It is argued that hedging activities have the potential to reduce the expected costs of financial distress as long as a firm is committed *ex ante* to a hedging strategy after debt proceeds are received (Geczy et al. 1997). This is because hedging would help stabilise the firm's cash-flow, to the extent that enough funds would be available to cover obligations, which may increase firm value (Stulz 1996; Smith and Stulz 1985). In a theoretical explanation, Smith and Stulz (1985) show that a levered firm with volatile cash-flow has the incentive to hedge to reduce its expected after-tax value net of financial distress costs because the transaction costs of financial

distress are a decreasing function of firm value, and the tax rate on cash flows net of interest payment is an increasing function of firm value. By hedging, therefore, a levered firm would reduce the variability in its future value, which would in turn reduce its expected costs of financial distress.

In addition, the financial distress theory suggests that small firms are more likely to have volatile cash-flows and have more restrictions on access to external capital, which would make them use more derivatives than large firms (Stulz 1996). In contrast, it is argued that small firms may be too financially constrained to consider hedging because the financing needs of valuable projects would make them downplay their hedging concerns (Rampini and Viswanathan 2010). In addition, it is argued that small firms do not have the propensity to use derivatives because they lack the upfront costs required for the employment and training of risk management personnel as well as the acquisition of computer software and hardware (Dolde 1993). Further, it is argued that large firms may possess greater information and transaction economies of scale than smaller firms because of high economy of scale of information and low transaction costs, which would create greater incentive for the large firms to hedge (Guay and Kothari 2003; Nance et al. 1993). Thus, the direction of the effect of firm size on derivatives use is inconclusive and we make no assumption about it.

Firms are more likely to use derivatives if variability in cash-flow arises from exposure to market risks that could impose ‘‘real’’ costs on the firms (Stulz 1996). Geczy et al. (1997) argue that a firm’s decision to hedge may depend on the level of its exposure to foreign exchange risk. Also, it is argued that the cash-flow of a firm that has substantial foreign operations, export and import activities may be exposed to large volatility when exchange rates are unfavourable (Allayannis and Weston 2001; Holmstron and Tirole 2000). Further, it is argued that there is an association between interest rates and inflation rates, which may exist for both short and long term interest rates (Ang et al. 2008; Berument et al. 2007; Fisher 1930). Hence, we define firms’ exposure to *ex ante* foreign exchange risk by using a dummy that equals one as an indicator of foreign exchange exposure if a firm reports foreign sales and/or discloses foreign tax or taxes in the notes to the accounts and/or reports overseas operations or writes qualitative discussion revealing the existence of import or export activities in the annual reports. If none of the above mentioned items is found in a firm’s annual report, it is taken not to have foreign exchange exposure and assigned the value of zero. Also, we proxy *ex ante* interest rate risk, and measure the variable as the ratio of earnings before interest and tax to interest expenses.

In the presence of costly external financing, firms may retain and use most of their internally generated resources to finance valuable projects, in so doing, reduce future cash-flow volatility and financial flexibility; and thus, have no incentive to hedge (Bonaime et al. 2013). It is argued that unless a firm hedges, it may at a certain point in time experience some short-falls in its cash-flow to the extent that it may find it difficult to fully meet its obligations (Froot et al. 1993; Smith and Stulz 1985; Bartram et al. 2011). Also, it is argued that dividend paying firms may be less exposed to cash-flow variability as they could reduce dividend payments to cover for cash-flow short-falls (Fazzari et al. 1988). Previous papers suggest that firms that have high liquid assets and distribute little cash as dividend are less likely to engage in hedging activities as it creates financial flexibility to avoid costly financial distress and underinvestment problems (Adam 2002; Bartram et al. 2011; Denis 2011; Spano 2007; Nance et al. 1993).

We use two proxies for hedging substitutes, namely, the liquidity (quick ratio) and the dividend pay-out ratio to examine the correctness of these arguments. We measure firms' ability to repay short-term operating liabilities with readily available cash by using the quick ratio, measured by subtracting inventories from the current assets held by firms and then scaling the result by current liabilities. Also, we account for undistributed profits that may be ploughed back into firms' finances to meet financial obligations by using the ratio of cash dividend paid in a given year to total assets. Alternatively we use a dividend dummy that equals 1 if a firm pays a cash dividend in a given year and 0 if otherwise. We expect a negative relationship between liquidity and hedging, and a positive/negative relation between dividend pay-out ratio and hedging.

We test the validity of the hypothesis on the expected financial distress using *leverage, KZ-index, cash-flow volatility*, and *firm size*. First, we examine the effects of the likelihood of encountering financial distress by using the *leverage ratio,* which is measured as the ratio of both short-term and long-term debt to total assets. We use the leverage ratio because previous research argues that firms that have a higher financial leverage ratio may face higher costs of financial distress and therefore would be more likely to use derivatives (Wruck 1990). Second, we measure a variable that accounts for both the probability of financial distress as well as the costs of financial constraints: the *KZ-Index* (Kaplan and Zingales 1997a). We compute the KZ index as $-1.002X_1 + 0.283X_2 + 3.139X_3 - 39.368X_4 – 1.315X_5$. Where $X_1$is cash-flow, X_2 is the market to book ratio, X_3 is the leverage, X_4 is dividends and X_5 is cash-holding. The X_3 (leverage ratio) that is in the KZ-index captures the probability of encountering financial distress; while the X1 (cash-flow), X2 (market to book), X4 (dividend pay-out), and X5 (cash-

holdings) capture the cost of financial constraints. A high KZ-index implies a strong financial situation and therefore low financial constraints; thus, a firm is less likely to use derivatives. Accordingly, we predict that a firm's propensity to use derivatives will be positively (negatively) influenced by *leverage (KZ-index).* This is because a firm that has high cash-flow volatility may at a point in time experience some short-falls in its internal liquid assets to the extent that it may find it difficult to invest in valuable project as well as find it difficult to fully meet its fixed payment obligations (Froot et al. 1993; Smith and Stulz 1985; Bartram et al. 2011). Bodnar et al. (1998) find that the attempt to reduce cash-flows and earnings volatilities is the main reason why firms hedge. We control for the influence of cash-flow volatility on firm decision to hedge and define cash-flow volatility as the standard deviation of cash flows divided by the average total assets, where cash-flow is defined as the ratio of pre-tax profit plus depreciation to total assets. Third, we proxy for the effect of firm size on the derivatives decision by using the natural logarithm of total assets, and to account for the effect of inflation on a firm's assets, which may bias our results, we rebase the annual total assets that our sampled firms have using 2004 retail price index.

2.2.2.2: Underinvestment problem

In an imperfect capital market, a firm's investment decisions are a function of financial factors, such as the functionality of the financial markets, a firm's access to the capital markets and the volume of internal finance available to the firm. In the presence of asymmetric information, it may be costly and/or difficult for fund providers to adequately evaluate the quality of a firm's investment opportunity sets, which may make it difficult to obtain reliable information about its future cash-flows. In such a situation, a firm may experience a high cost of capital and possibly cutting back on investment (Easley and O'Hara 2004; Fazzari et al. 1988; Froot et al. 1993; He et al. 2013; Myers and Majluf 1984; Wruck 1990). If external funds are more costly than internally generated ones, to the extent that a firm finds it difficult to finance all valuable projects, an incentive to hedge is created (Froot et al. 1993; Myers 1977). This is because hedging ensures that firms have enough internal funds to undertake valuable projects, which would enable them to avoid costly external financing as well as mitigate the underinvestment problem (Froot et al. 1993). Past studies suggest that firms with valuable investment opportunities and/or growth options are more likely to have underinvestment problems due to high information asymmetry and high agency costs of debt overhang and, thus, would have

greater incentive to use derivatives (Marshall et al. 2013; Allayannis and Ofek 2001). We use *investment opportunities* and *growth options* to test the validity of the underinvestment propositions. A firm's growth opportunity includes all discretionary expenditure such as acquisitions of other firms, maintenance and replacement of existing assets, investments in goodwill, capacity expansion projects and introduction of new products (Gaver and Gaver 1993; Mason and Merton 1985), and may be effectively captured by the market-to-book ratio (alternatively termed Tobin's Q), as it contains important information about the book value of assets as well as the market of value of equity (Adam and Goyal 2008).

The market-to-book variable was used in some previous studies to capture the quality of management (Lang, et al. 1989; Smith and Watt 1992), firm performance (Arslan-Ayaydin et al. 2012; Florackis et al. 2009; Ozkan and Ozkan 2004), agency problems (Smith and Watt 1992), intangible assets (Smith and Watt 1992), and firm value (Allayannis et al. 2012; Carter et al. 2006; Fauver and Naranjo 2010). This is possible because market-to-book captures the present value of all future cash-flows both from assets in place and from the investment opportunities that may accrue to shareholders (Adam and Goyal 2008; Chung and Charoenwong 1991). Following some previous studies such as Allayannis et al. (2012); Arslan-Ayaydin et al. (2012); Florackis et al. (2009); Ozkan and Ozkan (2004), we adopt a conventional computation of market-to-book ratio: the ratio of total book value of assets minus book value of equity plus market value of equity to book value of assets. In line with the arguments we present above, we expect a positive relation between *market to book* and a firm's propensity to use derivatives. Also, we follow past studies and measure a firm's growth option by the *capital expenditure*. The variable is computed as the ratio of a firm's capital expenses in a given year to total assets, and we expect that a firm's propensity to use derivatives will be positively influenced by its capital expenses.

To measure the information asymmetric that may exist about the quality of a firm's new projects we use the ratio of intangible assets to total assets (Intangibility ratio). According to past studies, firms with high intangible assets may find it difficult to raise external funds to finance valuable projects because the markets may not be able to ascertain the quality of the assets as valuable collateral and may presume that the firm has greater informational asymmetries about the quality of the new projects (Frank and Goyal 2009; Gay and Nam 1998; Titman and Wessels 1988). Thus, we expect a positive association between intangibility ratio and derivatives usage. We also consider various alternative proxies of information asymmetries

used in past studies, such as the R&D intensity. According to past studies, R&D costs offer good predictions about the development of a firm's future projects (Fauver and Naranjo 2010). However, most of the firms in our sample do not report R&D expenditure in their financial reports. In order not to lose a significant number of firms, we employ an alternative proxy. Thus, our hypotheses are:

Hypothesis 2.2a: There is a positive association between *investment opportunities* (*growth options*) and a firm's propensity to hedge with derivatives.

Hypothesis 2.2b: There is a positive association between *intangible assets* and a firm's propensity to hedge with derivatives.

2.2.2.3: Tax liability

To the extent that corporate hedging could reduce taxable income volatility, firms that have convex effective tax functions have an incentive to use derivatives to reduce their expected tax liabilities (Smith and Stulz 1985). A high tax liability creates an incentive for firms to hedge. By engaging in hedging activities, firms may increase their debt capacity, which would allow them to increase their debt as well as increase the associated interest deductions that would reduce tax liability (Leland 1998; Ross 1997; Stulz 1996). We therefore compute tax liability as a factor that motivates firms to hedge so as to lower the volatility of their taxable future income, by using the ratio of total tax expenses in a financial year to the firm's total assets. While this proxy has the ability on its own to reflect the tax hypothesis for the hedging decision, it also relates to the hypothesis on financial distress as it could be used to identify firms that are currently facing or previously suffered from or could potentially in the near future face financial distress (Clark and Judge 2008).

Hypothesis 2.4: There is a positive association between *tax liability* and derivatives usage.

2.2.2.4: Agency problem and ownership structure

2.2.2.4.1: Agency problem

The separation of ownership from control creates an ''agency problem'' between the shareholders and the managers (Berle and Means 1932). In the presence of the agency problem, firms may face high agency costs if the interests of the managers are not properly aligned with

those of the shareholders and firms (Fama and Jensen 1983; Jensen 1986). It is argued that firms with high agency problems may prefer to use derivatives so they can avoid scrutiny, monitoring and possibly discipline, in the event that they seek external financing. This is because seeking external funds would expose them to the capital market (Tufano 1998). In addition, it is argued that lack of market discipline may accentuate the agency costs that exist in firms with a high agency problem because managers would be more likely to pursue negative NPV projects by inefficiently allocating firms' wealth and consuming personal perquisites (Tufano 1998).

To investigate the effects of agency costs on a firm's propensity to hedge with derivatives, we employ the *asset utilisation ratio.* According to past studies, the *asset utilisation ratio* measures how efficiently managements have used a firm's assets to generate wealth (Ang et al. 2000; Florackis and Ozkan 2009; Singh and Davidson 2004). A high *asset utilisation ratio* suggests that managers effectively deploy the assets of their firms by investing in productive assets and pursuing valuable projects that result in significant sales. It thus indicates that firms have low agency costs and do not have need to hedge. In contrast, a low *asset utilisation ratio* indicates highly inefficient asset utilisation as management may be making poor investment decisions and/or consuming excessive perquisites by investing in unproductive assets. Hence, agency costs would be high and firm would be more likely to hedge to reduce exposure to market scrutiny and discipline (Ang et al. 2000; Tufano 1998). We measure the *asset_utilisation ratio* as ratio of sales to total assets and hypothesise that;

Hypothesis 2.4: There is a negative association between asset utilisation and derivatives usage.

2.2.2.4.2: Ownership structure

2.2.2.4.2.1: Insider ownership

In an imperfect capital market, the investments of corporations are exposed to both the systematic and idiosyncratic risks, which may lead to firm-level cash-flow volatility. In corporations, the interest of the shareholders to maximise wealth and the interest of the managers to utilise wealth create agency conflict (Jensen and Meckling 1976). To mitigate the agency conflict, the proponents of alignment theory argue that when managers own a fraction of shares in the firms' they manage, they would act like shareholders and thus, pursue the interest of the firms (Florackis et al. 2009; Jensen 1986). Considering the above explanations,

the proponents of risk aversion theory argue that high managerial shareholdings may create incentive for managers to cut back on their firms' investments so as to reduce their undiversified exposure to risks (Coles et al. 2006; Low 2009; Smith and Stulz 1985). Panousi and Papanikolaou (2012), for example, show in a recent study that the investment of firms with high insider shareholding fell by 8 per cent, compared to a fall of 2 per cent in firms with fewer insider shareholdings in 2008-2009. Then, the hedging theory argues that since cash-flow volatilities can be reduced through hedging with derivatives, firms with underinvestment problems have incentives to hedge to mitigate their exposure to volatile cash-flows as well as ensure they have enough funds to undertake valuable projects (Froot et al. 1993). In view of this, the convergence of interest and risk averseness argues that insiders' share-ownership is likely to create an incentive for a firm to hedge, as in so doing, the managers who are less diversified would reduce the volatility of their own wealth and thus, would not cut back on investment but undertake investment policies that would maximise firm value. By implication therefore, there is a positive effect of insider ownership on a firm's incentive to use derivatives.

In contrast to the above arguments, the entrenchment hypothesis suggests that a higher level of insider ownership may induce high usage of derivatives to increase insiders' opportunism (Fama and Jensen 1983). Tufano (1998) argues that insiders with high ownership may use derivatives to avoid capital market scrutiny, monitoring and discipline, thereby allowing insiders to inefficiently allocate firms' resources or even pursue negative NPV projects. On the other hand, it is argued that insiders bear a larger share of the costs of deviating from value-maximising strategies. This is because unlike other shareholders, the wealth of insiders in the form of compensation and shareholdings is concentrated in a firm and thus they are largely undiversified (Demertz and Lehn 1988; Jensen and Meckling 1976; Morck et al. 1988). In view of this, therefore, when insiders hold a higher level equity in their firms, they are more likely to encourage the firm to hedge to mitigate any volatility in their income.

From the perspective of a firm's access to the capital market, it is also argued that insider ownership may have a negative relation with a firm's propensity to hedge. If there is a correlation between insider ownership and a firm's access to external finance, a firm with high insider ownership may not have difficulty in accessing external funds and may have low cost of capital because of the reputation of the insiders, and as such may not have to cut back its investment (Panousi and Papanikolaou 2012). If a firm does not have financing constraints or an underinvestment problem then, it may not have an incentive to hedge to finance valuable

projects (Froot et al. 1993). Also, it is argued that the shareholders of a firm with low insider ownership may force insiders to take on more debt to mitigate the free cash flow (FCF) problem. To the extent that more debt increases expected costs of financial distress, the probability that such a firm would use derivatives would increase (Jensen 1986; Smith and Stulz 1985).

We test the validity of the ownership structure hypotheses by examining the impacts of *insiders' ownership* on a firm's propensity to hedge with derivatives. We use several proxies to measure *insiders' ownership*. First, we use the board of directors' ownership as a ratio of board of directors' share-ownership to outstanding shares. The design and planning of risk management are part of the strategic policies that involve the board of directors. Hence, the attitude and volume of shares held by the board of directors may affect whether a firm uses derivatives or not (Dionne 2013). Second, we separate the board of directors' ownership into non-executive, and chief executive and chief finance officers' ownerships. The non-executive members of the board have a fiduciary duty to protect the interests of the shareholders. Hence, if hedging is a wealth-increasing strategy, the presence of non-executive directors would induce firms to use derivatives. Thus, we hypothesise that:

Hypothesis 2.5a: There is a positive association between insiders' ownership and a firm's propensity to hedge with derivatives.

Hypothesis 2.5b: There is a negative association between insiders' ownership and a firm's propensity to hedge with derivatives.

2.2.2.4.2.2: Institutional ownership

In theory, hedging is a value-maximising strategy. According to the literature, institutional ownership is a very important corporate governance mechanism that shareholders may use in the event of the agency problem, to effectively monitor and influence managers' decisions to ensure that value-enhancing decisions are made (Gillan and Starks 2000; La Porta et al. 2000; Carleton et al. 1998). This is because of institutional investors' low monitoring costs and their ability to gather and process information. Further, theories indicate that hedging has the potential to stabilise a firm's cash flow. For example, Froot et al. (1993) argued that hedging ensures that firms that have difficulties in accessing external funds have enough internal funds to finance profitable projects. Smith and Stulz (1985) suggest that in the presence of financial distress costs, hedging ensures that firms are able to cover their financial obligations. Also, it

is argued that institutional investors have strong preference for low volatility and large firms (Ferraira and Matos 2008; Hutchinson et al. 2015; Rubin and Smith 2009). This is because smaller firms are more likely to be volatile, and due to the large stake of institutional investors in the firms they invest in, they may lose more if smaller firms fail.

Taking the above explanations together, a firm with a large presence of institutional investors is more likely to use derivatives to reduce cash flow volatility, and ensure that there are sufficient internal funds to finance investment, thereby improving the overall firm performance. In contrast, however, it is argued that, since institutional investors have a preference for low volatility, they may exert pressure on managers to cut back on leverage (Chung and Wang 2014). In addition, it is shown that the presence of institutional investors has positive effects on a firm's access to external fund. To the extent that firms with high presence of institutional owners are more likely to have lower agency costs due to better monitoring, the capital market will demand lower premiums for the costs of capital (Roberts and Yuan 2010). Then, if these arguments hold true, institutional ownership has a negative effect on a firm's propensity to hedge because expected costs of financial distress and costly access to external finance are predicted to have negative influence on a firm's propensity to hedge (Froot et al. 1993; Smith and Stulz 1985; Tai et al 2014).

Thus, we examine the impacts of *institutional ownerships* on a firm's propensity to hedge. We hypothesise that:

Hypothesis 2.6a: There is a positive association between total institutional ownership and a firm's propensity to hedge with derivatives.

Hypothesis 2.6b: There is a negative association between total institutional ownership and a firm's propensity to hedge with derivatives.

Broadly speaking, we measure total institutional ownership (*TOT_Ins_Owners*) as the ratio of institutional ownership to a firm's outstanding shares. Further, we classify the *TOT_Ins_Owners* into two different types of investors based on their business relations with the firms they invest in: the independent (mutual funds managers and investment advisers) and the grey (banks and their trusts, insurance companies, and other institutions) institutional investors. The independent investors are ''pressure-resistant'' investors that have lower costs associated with their managerial monitoring activities due to the fewer business ties they have

with the firms they invest in (Almazan et al. 2005; Brickley et al. 1988; Chen et al. 2007; Ferraira and Matos 2008). According to these studies, independent investors have a great preference for shareholders' value maximisation and, therefore, actively monitor and mount pressure directly and indirectly on managers to pursue policies that maximise shareholders' value. Then, since hedging is a value-maximising strategy and the independent investors have a preference to maximise values, we hypothesise that there is a positive relation between independent investors' shareholdings and a firm's propensity to use derivatives. Grey institutional investors, on the other hand, are ''pressure-sensitive'' investors.

We proceed to the next section, which explains the data collection as well as some econometric issues that were faced in the chapter.

2.3: Research Design

2.3.1: Data

2.3.1.1: Definition of corporate hedging

Our study employs only off-balance sheet hedging instruments. We exclude on-balance sheet hedging instruments from the study because of the difficulties encountered in identifying and ascertaining whether firms employ on-balance sheet items such as moving or locating production facilities in major foreign markets for hedging purpose or not. Nance et al. (1993) also cited the same reason for excluding on-balance sheet hedging instruments. The chapter focuses on the financial derivative instruments that non-financial firms use for hedging purposes only. We find about 92.8 cases of disclaimers that firms ''do not use derivative financial instruments for speculative or trading purposes'' in financial statements. We define hedging as a binary number that takes the value of 1 if a firm reports the use of foreign exchange, interest rate and/or commodity derivatives and 0 if otherwise. We use the terms corporate hedging and financial derivative instruments interchangeably in the course of our study.

2.3.1.2: Sample construction

We randomly select our sample from firms quoted on the FTSE All-Share index for the period, 2005-2011. As we do not intend to focus our study on only large firms as was done by most previous studies in this area of study, the FTSE All-Share provides us with the opportunity to

focus on a sophisticated exchange that has both large and small firms across various industrial sectors, as well as widespread use of financial derivative instruments among listed non-financial firms. Our sample period starts from 2005 because the IFRS requires non-financial firms, starting from 2005, to report their hedging activities by documenting information about their derivatives usage and their positions. It is important to note that UK non-financial firms do not report their end-of-the-year outstanding derivatives positions in the same way. Hence, we are unable to collect continuous derivatives information.

We source and hand-collect information about a firm's derivative usage by carrying out a comprehensive search of the firm's annual financial statement using an extensive search index[7] as used by prior studies such as Bartram et al. (2009); Nelson et al. (2005); Purnanandam (2008). Thereafter, we carefully read the full texts of the sections of the financial statements that contain any of the keywords to ascertain whether the firm hedged using financial derivative instruments or not. Information about firms' derivative usage is mostly found under sub-headings like the financial review, treasury policies, risk management activities, as well as the notes to the accounts sections of the financial statements. Due to the way in which we collect the information on derivative usage, we are unable to have a large sample. We collect derivatives usage information of 341 non-financial firms that represents 2,387 firm-years.

Further, we source and collect by hand detailed information about the ownership structure of our sampled firms from the Thomson One Banker website. We first hand-collect the names of the board of directors in each firm and in each year. Second, we collect by hand the list of all the shareholders in each firm as well as their shareholdings. Then, we arrange and match the names of the board of directors with the list of the firm's shareholders and their shareholdings for each period. In order to examine the impact of chief executive and chief finance directors on hedging decisions, we carefully look at ownership by executive directors and separate ownership by chief executive and chief finance directors from ownership by other executive directors.

Then, we collect information about the ownership of institutional investors, including the ownerships of the independent institutional investors and those of grey institutional investors. To collect institutional ownership data, we exclude strategic investors and their shareholdings

[7]. See Appendix 2.2 for the lists of keywords that we used in identifying hedging firms.

from the list of all shareholders[8]. Then, we match our ownership structure data with the derivative usage data. Lastly, we source and collect the financial data that are used in the computation of our variables from the Datastream and Thomson One databases. We collect a large volume of data for a large number of firm-year observations. However, due to the limitation of our derivative usage data, we lose a large number of firm-year observations. This is because the financial data are matched with our other data mentioned above, to enable us to conduct our regressions.

Following past studies, we subject all data to further standard data restrictions. First, we exclude firms that are in the financial and public utility sectors. This is because financial firms are market makers and the motivations for their use of derivatives may be somewhat different from the non-financial firms. The public utilities are excluded as they are subject to heavy regulation that is different from non-financial firms. Second, we exclude about thirty-four different firms because of non-availability of explanatory data. Lastly, based on the arguments in the econometrics literature that outliers from an unusual large error and/or value of a regressor may have substantial undesirable influence on the fitted values generated by a dataset (Belsley et al. 1980; Chatterjee and Hadi 1986), we identify the leverage points that are in our dataset by plotting Histogram graphs. Then, we eliminate the effect of possible outliers, by winsorising our variables at the 0.5 per cent at both ends of the distributions. Following our data cleaning, our overall dataset consists of about 244 non-financial firms with 1,850 firm-year observations.

2.3.1.3: Evolution of Corporate Hedging of UK Non-financial Firms

In this section, we study the distribution of derivatives usage of our sample. This is important as it provides us with a first glimpse of how our sample hedges over the period, 2005-2011.

Table 2.1 reports the trend of derivatives usage of UK non-financial firms by year. The result in Panel A of Table 2.1 shows the number of firms that hedge with derivatives (*N*) in a given year as well as their percentage of usage. The table shows that there is an increase in the percentage of derivatives users from about 55 per cent derivatives users in 2005 (before the financial crisis) to 65.02 per cent in 2009 (during the financial crisis), and it remains relatively steady afterwards. This indicates an increase of 15.15 per cent in the number of firms that

[8] The investor types are based on Thomson One Banker investors' classification.

changed their hedging policy between 2005 and 2009. These findings are in line with prior studies that argue that firms would be more likely to hedge when macroeconomic uncertainty is high due to increased exposure to financial distress costs (Bartram et al. 2009).

We investigate the usage proportion of the foreign exchange, interest rate and commodity derivative instruments of our sample over the period 2005-2011 in Panel B of Table 2.1. The table shows the number and percentage of the three types of financial derivative instruments as used by UK firms. We find that UK firms use more foreign currency derivatives (between 51.13 per cent and 55.34 per cent of foreign currency derivative usage), followed by interest rate derivative instruments (from 38.50 to 41.34 per cent usage) and then commodity derivatives (of 5.83 and 8.61 per cent of commodity derivatives usage). This finding is consistent with the findings in a previous study that UK firms have increased their presence in the international business environment to the extent that they use more foreign exchange derivatives to reduce their exposure to foreign exchange risks (Zhou and Wang 2013).

Table 2:1: Derivatives usage activities of UK firms by year

This table presents the derivatives usage activities of the UK non-financial firms by year. Panel A shows the number and percentage of firms that use derivatives and those that do not in a given year. Derivatives users are identified as firms that report the use of any foreign exchange, interest rate and/or commodity derivatives in their annual report; and have a binary number that equals 1. Non-users are defined as firms that do not report the use of derivatives in their annual reports; and given 0. Panel B shows the number of times each type of derivative is used and their percentage of usage in a given year. Foreign exchange derivative users are firms that report hedging with foreign exchange derivative instruments such as forward contracts, options, futures, swaps and other FX derivatives. Interest rate derivative users are those firms that hedge with interest rate derivatives such as interest rate swaps, caps, collars and other interest rate derivatives. Commodity derivative users are firms that hedge with commodity contracts such as fuel, gold, oil and other commodity contracts.

Panel A: Derivative usage activities	**2005**		**2006**		**2007**		**2008**		**2009**		**2010**		**2011**	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Derivative users	144	55.17	152	57.36	162	60.90	169	63.53	171	65.02	174	65.66	173	65.53
Non-users	117	44.83	113	42.64	104	39.10	97	36.47	92	34.98	91	34.34	91	34.47
Total	**261**	**100**	**265**	**100**	**266**	**100**	**266**	**100**	**263**	**100**	**265**	**100**	**264**	**100**
Panel B: Types of Derivatives														
Foreign exchange users	114	55.34	121	53.54	128	52.24	132	51.97	136	51.13	137	51.31	134	51.34
Interest rate users	80	38.83	87	38.50	98	40.00	105	41.34	107	40.23	107	40.07	105	40.23
Commodity users	12	5.83	18	7.96	19	7.76	17	6.69	23	8.65	23	8.61	22	8.43
Total	**206**	**100**	**226**	**100**	**245**	**100**	**254**	**100**	**266**	**100**	**267**	**100**	**261**	**100**

2.3.2: Methodology

In this section, we discuss the empirical models and methods used in the regression analyses carried out in this chapter.

We perform two different types of univariate tests as well as several multivariate regression analyses. In the univariate analysis, we first examine whether there are distinctions between the characteristics of firms that hedge with derivatives and those that do not by using the full sample. Then, we investigate the distinctions between the characteristics of derivatives users and non-users based on the three prevailing macro-economic conditions, i.e., pre-crisis, during a financial crisis and post-crisis. In multivariate regression analysis, we estimate several logistic models. We employ the *logistic function: logit regression* because our dependent variable is a binary variable that is drawn from an underlying qualitative variable (see explanations in section 2.3.1.1) that takes the value of 1 if a firm hedges and 0 otherwise. The classical OLS estimator in the form of *Linear probability model*[9] may be inefficient, in the presence of limited dependent variables, because of the conditional expectation that $\beta(x)$ is equal to $E(y_i \mid x_i)$ (Green 2008; Kennedy 2008; Maddala 1983). This is because such a condition may compel the probability estimates to take the values of $1-\beta x$ and $-\beta x$, which may fall outside 1 and 0 (Kennedy 2008; Maddala 1983).

The logit regression, on the other hand, assumes a probability function[10] by compelling the probability estimate to fall within the admissible interval of 1 and 0 because the dependent variable, which in our case is corporate hedging, is equal to 1 and is a function of the coefficient of an explanatory variable (Kennedy 2008). Thus, we begin the analysis by first estimating a pooled logistic regression, using our full sample, to examine the factors influencing a firm's decision to use derivatives. The framework of the logistic model is thus,

$$\Pr(Der\_Use = 1) = \frac{1}{1+e^{\alpha+x\beta}} \qquad \text{Equation (2.1)}$$

[9] The linear probability model is an ordinary least square model that is used when the dependent variable assumes a binary variable that takes the value of 1 and 0 otherwise (Maddala 1983). Thus, the framework is: $y = \beta(x) + u$, and gives the interpretation that the marginal effect of an explanatory variable $\beta(x)$ on the explained variable (y) is with certainty given by the coefficient of $\beta(x)$. See econometrics textbooks such as Green 2008; Kennedy 2008; Maddala 1983 for detailed explanations

[10] Functional $Prob(y=1) = f(x)$

Where Der_use is a binary indicator that takes the value of 1 if a firm hedge with foreign currency, interest rate and/or commodity derivatives in a given year and 0 otherwise, $\boldsymbol{\alpha}$ is a constant, $\boldsymbol{\beta}$ is the vector of coefficients and **X** is a matrix of the independent variables, which include: *Leverage, KZ-index, z-score, investment opportunities, capital expenditure, cash-flow volatility, firm size, dividend pay-out ratio, interest cover, geographical diversification dummy, foreign exchange dummy and tax liability.* To extend the existing literature, we also include the agency and ownership structure variables: *asset turnover ratio, insiders' and institutional investors' shareholdings*. Further, we include industry and year dummies to control for the possibility that corporate hedging decision is influenced by the industry type that the firm belongs to and the year effects. Definitions of all the variables are presented in Appendix 2.3.

Second, we perform similar pooled logistic regression as discussed above, however, dividing our sample period into pre-crisis, during financial crisis and after the financial crisis. This additional analysis enables us to explore whether factors influencing a firm's decision to use derivatives during the three macro-economic environments differ. If, for example, leverage, which measures the probability that a firm would encounter financial distress, is counter-cyclical as argued in some studies (Choe et al. 1993), firms' propensity to use derivatives should differ when there is less uncertainty about the assets in place and lower adverse selection costs.

We perform diagnostic tests to assess the predictive accuracy of our models by testing the hypothesis that our models are correctly specified, using the area under the ROC curve (AUROC[11]). AUROC statistics of 1 connotes perfect prediction test, greater than 0.9 implies highly accurate and greater than 0.7 implies moderately accurate models. The AUROC statistics of our models are presented in the tables.

Lastly, we perform sensitivity analysis to explore change in the probability that a firm would hedge following an infinitesimal change (the 5 per cent interval to 100 per cent) in our continuous variables or a change in a dummy variable from zero to one, holding other

[11] ROC connotes receiver-operating characteristics analysis. The AUROC is a summary statistic of diagnostic accuracy that measures the probability that the hedging firms that are in our sample are correctly classified (sensitivity) against the probability that the non-hedging firms are correctly classified (specificity) observation. It perform the diagnostic function by varying the test cut-off value that is used, which enables it to exploit all possible combinations of sensitivity and specificity thus, avoiding the problem of Type I and Type II errors (Lee and Yao 2015). Type I error may occur if a hedging firm is incorrectly classified as a non-hedger and Type II error is misclassifying a non-hedger as a hedger.

variables constant at their respective means (Bartus 2005). The standard errors of all regression analyses are corrected for heteroscedasticity and clustered at the firm-level (Petersen 2009).

2.4: Results

In this section, we present the descriptive statistics of all variables as well as present the results of both univariate and multivariate tests that were conducted in this study.

2.4.1: Descriptive statistics

Table 2.2 reports the descriptive statistics on each variable that is used in our analyses. The shows the number of firm-year observations (*N*), mean, standard deviation (*Std dev*), minimum and maximum value for each variable. Derivatives usage is a binary indicator that takes the value of 1 if a firm hedges with foreign exchange, interest rate and/or commodity derivatives, 0 otherwise. The mean derivatives usage is 61.9 per cent with a standard deviation of 48.6 per cent, which is comparable with prior studies that find 60 per cent derivatives usage for UK firms (Mallin et al 2001), 64% for US pharmaceutical and biotech firms (Choi et al. 2013), and 60.3 per cent for international evidence (Bartram et al. 2009).

Asset turnover is the ratio of sales to total assets, and the mean is 1.169. The mean of capital expenditure to total assets ratio (*CAPX*) is 3.45 per cent with a standard deviation of 2.8 per cent. To measure the probability of encountering financial distress and financial constraints in each firm-year, we add leverage and the KZ-index. The mean ratio of total debt to total assets (Leverage) is 17.4 per cent, while that of the KZ-index is 14.6 per cent. Market to book ratio, which is measured as the ratio of total assets minus book value of equity plus market value of equity to book value of assets has a mean of 2.01 with a standard deviation of 0.71. The mean of firm size (*Size*), which is computed as a natural logarithm of total assets in 2004 retail price index is 18.37 with a standard deviation of 2.24.

The means of our proxies for business risks, cash-flow volatility and interest cover are 3.70 and 5.68 respectively; while the means of market risks proxies, FOREX_exposure, geographical and industry diversification are 0.78, 0.80 and 0.22 respectively. To measure the ownership structure of each firm-year, we use the percentage of board of directors and institutional investors' shareholdings. About 11.9 per cent of our sample's outstanding shares

are held by the board of directors and 49 per cent of the outstanding shares are held by total institutional investors (*TOT_ins_Owners*).

In Appendix 2.4, we present pairwise correlations of the main variables used in our study. All of the pairwise correlations are below 0.5, except the association between tangibility and CAPX, and dividend pay-out and KZ-index. The Appendix shows a significant positive correlation between hedging and leverage, which is consistent with the financial distress hypothesis. Institutional ownership is significantly positively correlated with hedging, consistent with the monitoring hypothesis. We find an insignificantly positive correlation between institutional ownership and assets utilisation. Further, we find that positive correlations between asset utilisation and our different measures of insider ownership (board of directors, executives, non-executives and chief executives and chief finance officers) and they are significant at the 5 per cent level. These findings suggest that high insiders' share ownership leads to efficient utilisation of assets.

Table 2:2: Descriptive Statistics

This table presents the summary statistics of all the variables used to examine the incentives for corporate derivatives usage. The statistics are estimated on the pooled dataset. The sample consist of observations from 2005 to 2011 for a sample of UK non-financial firms. The table shows the mean, median, minimum, maximum, standard deviations of the variables as well as their number of observations. Derivative usage is a binary indicator that takes the value of 1 if a firm hedges with foreign currency, interest rate and/or commodity derivatives. Definitions of all other variables are presented in Appendix 2.3.

Variables	N	Mean	Std dev	Min	Max
Panel A: Hedging variables					
Commodity_users	1,850	0.0725	0.2593	0.0000	1.0000
FOREX_users	1,850	0.4878	0.5000	0.0000	1.0000
Derivatives_usage	1,850	0.6189	0.4858	0.0000	1.0000
Interest_rate_userss	1,850	0.3726	0.4836	0.0000	1.0000
Panel B: Firm characteristics					
Asset_utilisation	1,850	1.1690	0.8838	0.0000	4.4500
CAPX	1,850	0.0345	0.0280	0.0000	0.0850
Dividend_dummy	1,850	0.6605	0.4737	0.0000	1.0000
Dividend_payout	1,850	0.0221	0.0317	0.0000	0.2000
Earnings surprises	1,850	0.0098	0.1871	-4.6190	3.8520
Intangibility	1,850	0.2387	0.2396	-0.0082	0.9310
KZ-index	1,850	0.1462	1.0030	-2.0000	2.3500
Leverage	1,850	0.1737	0.1800	0.0000	0.9678
Liquidity	1,850	1.5199	0.6687	0.0569	2.5000
Market to book	1,850	2.0065	0.7056	1.0000	3.2500
Size	1,850	18.3708	2.2354	11.3940	24.1729
Tangibility	1,850	0.2267	0.2335	0.0000	0.9782
Tax	1,850	0.0157	0.0301	-0.1000	0.1400
Z-score	1,850	4.0042	6.7574	-10.2192	15.0000
Panel C: Business and market risks variables					
Cash_flow_volatility	1,850	0.0370	0.0349	0.0000	0.1000
FOREX_exposure	1,850	0.7827	0.4125	0.0000	1.0000
GEO_diversification	1,850	0.8011	0.3993	0.0000	1.0000
Industry_diversification	1,850	0.2208	0.4149	0.0000	1.0000
Interest_cover	1,850	5.6784	6.7032	-9.4500	11.500
Panel D: Ownership structure variables					
Board_Owners	1,850	0.1185	0.1868	0.0000	1.0000
Sq_Board_Owners	1,850	0.2550	0.2312	0.0000	1.0000
CEO_CFO	1,850	0.0599	0.1303	0.0000	1.0000
Sq_CEO_CFO	1,850	0.1624	0.1830	0.0000	1.0000
Exec_Owners	1,850	0.0670	0.1429	0.0000	1.0000
Sq_Exec_Owners	1,850	0.1726	0.1928	0.0000	1.0000
Grey_Owners	1,850	0.0483	0.0917	0.0000	1.0000
Sq_Grey_Owners	1,850	0.1662	0.1437	0.0000	1.0000
Indep_Owners	1,850	0.4514	0.2977	0.0000	1.0000
Sq_Indep_Owners	1,850	0.6184	0.2626	0.0000	1.0000
Non_Exec_Owners	1,850	0.0551	0.1327	0.0000	1.0000
Sq_Exec_Owners	1,850	0.1726	0.1928	0.0000	1.0000
Other_Exec_Owners	1,850	0.0141	0.0754	0.0000	1.0000
Sq_Other_Exec_Owners	1,850	0.0444	0.1102	0.0000	1.0000
TOT_Ins_Owners	1,850	0.4895	0.3091	0.0000	1.0000
Sq_TOT_Ins_Owners	1,850	0.6477	0.2646	0.0000	1.0000

2.4.2: Univariate analysis

Table 2.3 reveals some distinct differences between the characteristics of firms that use derivatives and those that do not. In Panel A of Table 2.3, we present the results of whole sample period which provide support for most of our hypotheses. First, we find that the leverage (KZ-index) statistics for the derivatives users in our sample are significantly higher (lower) than those of non-users at the 1 per cent level. This is in line with the expected financial distress hypothesis because firms with high leverage and a low KZ-index are most likely to experience financial distress as well as have high costs associated with the financial distress (Smith and Stulz 1985). Second, the derivatives users are significantly larger than the non-users, which is consistent with the argument that larger firms have higher economies of scale and lower transaction costs and therefore have more incentive to hedge (Guay and Kothari 2003; Nance et al. 1993). Third, we find in line with the monitoring hypothesis that the derivatives users have higher percentages of total institutional ownerships than the non-users. This provides support for our hypothesis that firms that have significant monitoring and influence of institutional investors would hedge to ensure that value-maximising decisions are made.

Taken together with the results on firm size, cash flow volatility, these findings are not surprising as institutional investors have a strong preference for large and less volatile firms, because of their concern for liquidity and transaction costs; hence, they would own shares in firms that hedge with derivatives (Ferraira and Matos 2008; Gompers and Metrick 2001; Rubin and Smith 2009). Next, we find that derivative users have lower insider (board of directors, non-executive, and CEO_CFO) share-ownership than non-users, which is inconsistent with the alignment hypothesis but may support the entrenchment, FCF and access to external finance hypotheses. Further, the derivatives users appear to have a significantly higher assets utilisation ratio than non-users, which is consistent with the hypothesis that agency cost arising from the conflict of interests between shareholders and managers may be an important factor that induces firms to use derivatives, to avoid being subjected to market scrutiny and discipline (Ang et al. 2000; Florackis and Ozkan 2009; Tufano 1998).

Taking together the results about board of directors' ownership and assets utilisation, it seems derivatives users have substantial agency and transaction costs which may prevent them from accessing external financing. We find mixed evidence for some of the hypotheses on

underinvestment and agency costs. First, the derivatives users have significantly more capital expenses and more tangible assets than the non-users, which is in line with the underinvestment problem hypothesis, as firms with growth options are more likely to use derivatives to ensure they have sufficient internally generated funds to finance valuable growth options (Froot et al 1993). In contrast, the users have significantly lower market to book ratio than the non-users, which is inconsistent with the underinvestment argument.

Table 2.3 Panel B compares the characteristics of derivatives users in the pre-financial crisis, during the financial crisis and after the financial crisis periods. The table shows that, irrespective of the prevailing macroeconomic conditions, the variability of firms' cash flows, underinvestment costs, tax liability, dividend pay-out, size and exposure to foreign currency risks, statistically induce firms to use derivatives. Also, we find that large presence of institutional investors and low insiders' share-ownerships may significantly increase firms' propensity to hedge. Nevertheless, we find some noticeable variations in the characteristics of derivatives users under the three macroeconomic conditions. First, derivatives users have a lower KZ-index before and after the financial crisis, but a higher index during the financial crisis. This implies that the likelihood of facing financial distress and being financially constrained induce firms to use derivatives only when firms can accurately predict their cash flows (Baum et al. 2006).

Second, derivatives users have higher information asymmetry (intangibility) than non-users, and it is statistically significant in all periods, except pre-crisis. Also, the economic effect of asymmetric information in firms that use derivatives is considerably low and not different from that of non-users, in the pre-crisis period. Further, we find that the derivatives users have lower shareholdings of grey investors before the crisis. However during the crisis, the grey investors flip investment to invest more in firms that hedge with derivatives. This is consistent with the argument that institutional investors have a preference for larger and low volatility firms, because they are not likely to fail. Hence, a large presence of grey investors, which include banks, would be likely, based on their expertise, to influence firms to use derivatives during macroeconomic uncertainty (Rubin and Smith 2009).

Table 2:3: Characteristics of Hedging Firms.

This table shows the characteristics of our sample firms that hedged with derivatives. The statistics are estimated on the pooled dataset. Panel A provides the results of the firm characteristics comparison for derivatives users and non-users for the whole sample period, i.e., observations from 2005 to 2011. Panel B presents similar results for the pre-financial crisis with sample periods from 2005 to 2007 (columns 3 and 4), during with sample periods from 2008 to 2009 (columns 5 and 6) and after the financial with sample periods 2010 to 2011 (columns 7and 8). The last four columns show the t-statistics for difference in means between derivatives users and non-users. The associated significance levels are obtained from *t-test* with equal variances. ***, ** and * denote that the differences are significant at the 1%, 5% and 10% levels respectively. Definitions of all variable definitions are reported in Appendix 2.3.

	Panel A		Panel B									
	Whole sample		Pre-crisis period		During crisis period		After-crisis		T-statistics for difference in means			
Variables	Users (1)	Non-users (2)	Users (3)	Non-users (4)	Users (5)	Non-users (6)	Users (7)	Non-users (8)	(1) vs. (2)	(3) vs. (4)	(5) vs. (6)	(7) vs. (8)
Assets_utilisation	1.2327	1.0656	1.2665	1.0648	1.2019	1.0738	1.2182	1.0587	**0.1671*** **	**0.2017*** **	0.1281	**0.1595***
Board_Owners	0.0805	0.1801	0.0735	0.1797	0.0856	0.1785	0.0849	0.1826	**-0.0996*** **	**-0.1062*** **	**-0.0929*** **	**-0.0977*** **
CAPX	0.0378	0.0291	0.0428	0.0304	0.0369	0.0286	0.0322	0.0271	**0.0087*** **	**0.0124*** **	**0.0083*** **	**0.0051***
Cash_flow_volatility	0.0293	0.0495	0.0274	0.0463	0.0324	0.0545	0.0288	0.0501	**-0.0202*** **	**-0.0189*** **	**-0.0221*** **	**-0.0213*** **
CEO_CFO	0.0380	0.0953	0.0402	0.1023	0.0354	0.0933	0.0377	0.0846	**-0.0573*** **	**-0.0621*** **	**-0.0579*** **	**-0.0469*** **
Commodity_users	0.1170	0.0000	0.1070	0.0000	0.1176	0.0000	0.1297	0.0000	**0.1170*** **	**0.1070*** **	**0.1176*** **	**0.1297*** **
Div_dummy	0.8279	0.3875	0.8690	0.4174	0.8235	0.3810	0.7781	0.3389	**0.4404*** **	**0.4516*** **	**0.4425*** **	**0.4392*** **
Div_payout	0.0275	0.0133	0.0311	0.0134	0.0275	0.0132	0.0227	0.0131	**0.0142*** **	**0.0177*** **	**0.0143*** **	**0.0096*** **
Earnings_surprises	0.0002	0.0252	0.0003	0.0187	-0.0005	0.0151	0.0009	0.0478	**-0.0250*** **	**-0.0184*** *	-0.0156	**-0.0469*** **
Exec_Owners	0.0418	0.1077	0.0380	0.1143	0.0437	0.1011	0.0451	0.1026	**-0.0659*** **	**-0.0763*** **	**-0.0574*** **	**-0.0575*** **
FOREX_dummy	0.8699	0.6411	0.8777	0.6377	0.8588	0.6402	0.8703	0.6484	**0.2288*** **	**0.2400*** **	**0.2186*** **	**0.2219*** **
FOREX_users	0.7851	0.0000	0.7860	0.0000	0.7882	0.0000	0.7810	0.0000	**0.7851*** **	**0.7860*** **	**0.7882*** **	**0.7810*** **
GEO_dummy	0.8507	0.7206	0.8603	0.7096	0.8412	0.7302	0.8473	0.7308	**0.1301*** **	**0.1507*** **	**0.1110*** **	**0.1165*** **
Grey_Owners	0.0501	0.0452	0.0471	0.0490	0.0483	0.0413	0.0559	0.0424	0.0049	-0.0019	0.0070	**0.0135***
Indep_Owners	0.5442	0.3006	0.5424	0.3146	0.5484	0.3023	0.5424	0.2729	**0.2436*** **	**0.2278*** **	0.2461	**0.2695*** **
Industry_divers	0.2404	0.1901	0.2410	0.1861	0.2452	0.1844	0.2351	0.2035	**0.0503*** *	**0.0549***	0.0608	0.0316
Intangibility	0.2534	0.2150	0.2213	0.2126	0.2695	0.2219	0.2799	0.2121	**0.0384*** **	0.0087	**0.0476*** *	**0.0678*** **
Interest_cover	6.1313	4.9430	6.3724	5.4083	5.1186	4.2929	6.8053	4.7644	**1.1883*** **	**0.9641*** *	0.8257	**2.0409*** **
Interest_users	0.6009	0.0000	0.5764	0.0000	0.6235	0.0000	0.6110	0.0000	**0.6009*** **	**0.5764*** **	**0.6235*** **	**0.6110*** **
KZ-index	0.0946	0.2301	0.0720	0.3222	0.1120	0.0580	0.1073	0.2397	**-0.1355*** **	**-0.2502*** **	0.0540	-0.1324
Leverage	0.2198	0.0988	0.2233	0.0929	0.2396	0.1212	0.1955	0.0866	**0.1210*** **	**0.1304*** **	**0.1184*** **	**0.1089*** **
Liquidity	1.3968	1.7198	1.4054	1.7820	1.3847	1.6399	1.3974	1.6878	**-0.3230*** **	**-0.3766*** **	**-0.2552*** **	**-0.2904*** **
Market to book	1.8925	2.1918	2.0599	2.3809	1.7380	1.9636	1.8223	2.0817	**-0.2993*** **	**-0.3210*** **	**-0.2256*** **	**-0.2594*** **
Non_Exec_Owners	0.0388	0.0816	0.0355	0.0744	0.0421	0.0847	0.0398	0.0917	**-0.0428*** **	**-0.0389*** **	**-0.0426*** **	**-0.0519*** **
Size	19.3911	16.6960	19.4037	16.6454	19.4100	16.6945	19.3570	16.7917	**2.6951*** **	**2.7583*** **	**2.7165*** **	**2.5648*** **
Tangibility	0.2563	0.1784	0.2785	0.1788	0.2447	0.1888	0.2385	0.1669	**0.0779*** **	**0.0997*** **	**0.0559*** **	**0.0716*** **
Tax	0.0210	0.0070	0.0251	0.0111	0.0193	0.0014	0.0174	0.0051	**0.0140*** **	**0.0140*** **	**0.0179*** **	**0.0123*** **
TOT_Ins_Owners	0.5860	0.3329	0.5788	0.3471	0.5906	0.3343	0.5908	0.3052	**0.2531*** **	**0.2317*** **	**0.2563*****	**0.2856*** **
Other_exec_Owners	0.0077	0.0245	0.0054	0.0267	0.0097	0.0153	0.0089	0.0300	**-0.0168*** **	**-0.0213*** **	-0.0056	**-0.0211*** *
Z-score	4.8971	2.5540	5.3629	3.1219	4.1422	1.7076	5.0220	2.3909	**2.3431*** **	**2.2410*** **	**2.4346*** **	**2.6311*** **
Number of observations	1145	705	458	334	340	189	347	182				

Overall, the results suggest that derivatives users have a higher probability of facing financial distress costs, higher capital investment, a higher information asymmetry problem and higher percentage of institutional owners. Also, we find that financial constraint does not necessarily induce firms to use derivatives during a financial crisis, and asymmetric information may not be a very important factor that makes firms hedge before a financial crisis.

2.4.3: Multivariate analysis

In this section, we estimate models of the determinants of corporate hedging. We start by estimating logistic regression models using the full sample of 2005-2011 to examine the incentives for corporate derivatives usage with emphasis on the probability of financial distress costs. Then we estimate several logistic regression models using three different categories of macroeconomic conditions (i.e., pre-crisis, during financial crisis and after the financial crisis period) to investigate the incentives for corporate derivatives usage. The dependent variable is a 'binary variable' that equals 1 if a firm hedges with foreign currency, interest and/or commodity derivative instruments. Our baseline estimation is as follows:

$$Hedg_{it} = \beta_0 + \beta_1 Leverage_{it} + \beta_2 Market\text{-}to\text{-}Book_{it} + \beta_3 Capx_{it} + \beta_4 Tangibility_{it} - \beta_5 Tax_{it} - \beta_6 Quick\_Ratio_{it} + \beta_7 Div\_payout_{it} \pm \beta_8 Size_{it} + \beta_9 Ind\_Dummy_{it} + \beta_{10} Time\_Effect_{it} + \varepsilon_{it} \quad \text{Equation (2.2)}$$

2.4.3.1: Logistic regressions for a firm's propensity to hedge with derivatives – whole sample period

Table 2.4 shows the results from our logistic regression of a firm's propensity to use derivatives, for the whole sample period. In column (1), we estimate our baseline model and in the remaining columns we augment the model. We account for the effects of industry and year differences by including their proxies in all the models. In each case, the null hypothesis that the coefficients on the explanatory variables are zero is strongly rejected, with a Pseudo R-squared that ranges from 0.404 to 0.442 and AUROC statistics that range from 0.89 to 0.9. In model 1 we examine the impact of five different characteristics on a firm's propensity to use derivatives. First, we include leverage to investigate the effect of expected costs of financial distress; second, market to book and capex to examine the impact of underinvestment problems; third, tax to explore the effect of tax liability; next, we include quick ratio and dividend pay-out to examine the effect of a firm having hedging substitutes and lastly we

incorporate size to investigate the impact of firm size. The coefficient on leverage is positive and statistically significant at the 1 per cent level. Specifically, we find that a one per cent increase in the expected costs of financial distress leads to about 0.496 points of hedging with derivatives. The first finding is in line with existing theory and past empirical findings that the probability of encountering financial distress creates incentive for firms to hedge with derivatives (Judge 2006; Purnanandam 2008; Smith and Stulz 1985).

The second finding is that there is a positive relation between firm size and a firm's propensity to use derivatives. A one per cent increase in firm size (Size) is associated with a statistically significant increase of 0.101 points in using derivatives. The results provide strong support for the theoretical prediction on economies of scale; that larger firms are more likely to hedge. The potential explanation for the finding is that, from the firms' point of view, smaller firms are not able to use derivatives to hedge their exposure because they lack the financial sophistication and/or the understanding of either their financial risks or the derivative markets. Some past papers also used this interpretation (Marshall et al. 2013). An alternative interpretation that is somewhat similar to the above, but from the market point of view, is that the derivative markets may have stringent rules that make it difficult and/or costly for small firms to access them.

Thirdly, there is mixed evidence for the underinvestment hypothesis. First, we find a negative and insignificant association between market to book and a firm's incentive to use derivatives. This is consistent with our findings in the univariate analysis; however, it is inconsistent with the theory on underinvestment, which suggests that firms with more investment opportunities would use derivatives to ensure that they have sufficient internal funds so that they can avoid unnecessary cash-scrap and costly external financing that could hamper their investment expenditures (Froot et al. 1993). Second, the coefficient on capital expenditure is insignificantly positive, which is in line with the underinvestment argument that firms that have future growth options are more likely to hedge with derivatives.

In terms of the hedging substitutes, we find positive evidence that firms that distribute dividends to their shareholders are more likely to hedge with derivatives. We fail to reject the null hypothesis that dividend payout has no effect on derivatives usage at a 90 per cent level of confidence. Specifically, the coefficient on the dividend pay-out shows that there is about 95 per cent chance that a firm would hedge with derivatives following a one per cent change

in dividend payout. Our interpretation of the finding is that a dividend paying firm may, rather than use derivatives, reduce or stop distributing excess cash when in need of funds to finance valuable projects.

In model 2, we incorporate the cash-flow volatility and industry diversification variables into our main model to examine the effects of a firm's business risks on the likelihood of using derivatives. The findings in the base model remain unchanged except that the coefficient on market to book has become statistically significant at the 10 per cent level, while that of dividend pay-out has become insignificant. With regards to the firm's business risk variables, the coefficient on the cash-flow volatility is as predicted, although the effect is statistically insignificant. Specifically, cash-flow volatility has positive effects on a firm's propensity to use derivatives to the extent that a one standard deviation increase in cash-flow volatility results in a 0.277 per cent chance that the firm would hedge with derivatives. The finding is consistent with hedging theory as firms engage in hedging to reduce any variability in their cash-flows.

In model 3, we examine the effects of market risks on a firm's propensity to use derivatives. We include interest coverage, FOREX and geographical dummies to proxy the effects of a firm's exposure to the interest rate, foreign exchange risks and risk faced when diversified into other geographical regions. The model shows that a firm's exposure to interest rate risk has a positive but insignificant effect on a firm's decision to use derivatives; however, the impact is rather small in magnitude (0.0042). Further, we find that a firm's exposure to foreign exchange risk has a positive effect on the probability of hedging, with a coefficient of 0.1918. This implies that a firm that has foreign exchange exposure have a 19 per cent higher probability of hedging with derivatives. We carry out the likelihood ratio (LR) test to test the null hypothesis that the coefficient of foreign exchange exposure is zero. We strongly reject the null hypothesis at the 1 per cent level (chi^2 of 59.93) and conclude that a firm's exposure to foreign exchange risk has a positive effect on the decision to hedge with derivatives. Further, we find that geographical diversification has a negative effect on the propensity to hedge, with a coefficient of 0.0201, which implies that a firm that diversify into more than 1 geographical region has a 2 per cent lower probability of hedging. We test the null hypothesis that geographical diversification is zero but, fail to reject the null hypothesis. The joint hypothesis testing that the coefficients on foreign exchange exposure and geographical diversification are zero is strongly rejected at the 1 per cent significant level. Our finding on geographical

diversification is not consistent with the argument in some previous studies that a geographically diversified firm would use derivatives to reduce its exposure to international foreign exchange (Pantzalis et al. 2001). Nevertheless, we interpret our finding as suggesting that a diversified firm may take advantage of the different markets that it is in. To the extent that firms in each region use the financial markets where they are located, there may be no need for the Group to pool funds from different regions when in need of funds to finance valuable projects (Shapiro 1999). By using this means, a diversified firm might have reduced its exposure to international foreign exchange risk and therefore does not need to hedge with derivatives.

To examine the effects of agency costs and asymmetries information, we include the asset utilisation and intangibility ratio variables in model 4. As in the previous models, the coefficient of leverage is positive and significant at the 1 per cent level. However, the magnitude of the coefficient has become larger. A one per cent increase in leverage is associated with a statistically significant increase in the probability that a firm would use derivatives by 4.202 points. Also, the magnitude of the coefficient on capital expenditure is positive, larger and now significant at the 5 per cent level. The other variables are as they were in the previous models and for brevity we omit their interpretations. Looking at the variables of interest in model 4, the coefficients on intangibility and asset turnover have positive but insignificant effects on a firm's propensity to use derivatives. Taking together our findings on intangibility, assets utilisation ratio and market to book, we say that a firm that has high information asymmetries problems and low agency costs has low investment opportunity sets. Even if a firm does not have high agency costs, the presence of information asymmetries makes a firm hedge with derivatives to reduce its need for external funds, which would subject it to market scrutiny and discipline (Ang et al. 2000; Tufano 1998). Alternatively, the shareholders of a firm with high agency problems may compel managers to use derivatives to reduce agency and transaction costs, thereby mitigating underinvestment problems.

In model 5 we investigate the effects of a firm's ownership structure on the decision to hedge with derivatives. We include the ownerships of the board of directors and those of total institutional investors to our previous models. Board of directors' share-ownership has a statistically insignificant, negative effect on the probability that a firm would hedge. This finding could be interpreted in several ways. First from the alignment point of view, the interests of the directors are aligned with those of the shareholders; hence, the directors make

financing decisions that maximise firm wealth. This interpretation holds if corporate derivatives usage has wealth maximising ability (Allayannis and Weston 2001; Bartram et al. 2011; Bessembinder 1991; Carter et al 2006a&b; DeMarzo and Duffie 1991; Froot et al. 1993; Stulz, 1984; Smith and Stulz 1985). Second, the board of directors may engage in hedging activities to signal to the market their ability for good performance, the quality of the projects under their control and/or that their firms have good corporate governance mechanisms in place (DeMarzo and Duffie 1995). Our third explanation runs from board of directors' ownerships to firms' access to financial markets, and then to hedging decisions. The share-ownerships of the board of directors provide a good reputation for a firm to the extent that it becomes less difficult to access external financing. Since a firm would not have difficulty in gaining access to capital markets when necessary, hence, there is no need to hedge with derivatives (Froot et al. 1993). Further, we find a statistically significant, positive association between the ownership of the institutional investors and a firm's propensity to use derivatives. This finding provides support for the monitoring hypothesis that a firm whose activities are strongly monitored and influenced by institutional investors will be more likely to use derivatives. In model 6, we continue our investigation on the effects of a firm's ownership structure on the decision to hedge with derivatives. We exclude the assets_utilisation variable from the previous model (model 5). Our findings are similar presented above, except that the sign on the Board_Owners variable changes to positive, although it is not significant.

In model 7, we examine whether ownership structure has a nonlinear effect on corporate hedging policy. We include higher Board of director's ownership (Board_Owners squared) variable that is computed by squaring the shareholdings of the board of directors as well as the higher institutional ownership (TOT_Ins_Owners squared) variable that is computed by squaring the shareholding of total institutional investors. We find that there is a nonlinear relationship between the shareholdings of the board of directors' ownership and firm's hedging policy, although the association is insignificant. The likelihood of having a hedging policy first increases, then decreases, as the shareholding of the board of directors' increase. We could not find any economic reason why high board of directors' shareholdings will lead firms to lower hedging. Nevertheless, considering our findings in the univariate tests, that insiders hold more shares in non-hedging firms and these firms have lower intangible assets (low information asymmetries) and higher market to book ratio (high growth opportunities) than hedging firms. It is possible that non-hedging firms give more share positions to the

directors as remuneration to ensure the directors pursue profit-maximising policies. This explanation is comparable to Morck et al. (1988), who suggest that there is ‘‘an optimal trade-off between profits and private benefits to the management from on-value-maximising behaviour’’ (p313). It is also comparable to Demsetz and Lehn (1985), who say that firms that have a lot of intangible assets give greater shares to their managements to ensure proper management of their assets. Further, we find that the effect of institutional ownership on hedging decisions is linear, though insignificant. This finding suggests that irrespective of the levels of ownership (both lower and higher), institutional investors are more like to monitor and influence firms to engage in hedging activities.

Further, in model 8, various measures of board of directors' and total institutional investors' shareholdings are introduced into the model. We use the measure of shares held by the non-executives (Non_Exec_Owners) and the chief executive and chief finance officers (CEO_CFO) in place of board of directors' share-ownerships; and the measure of shares held by grey and independent institutional investors in place of the total institutional investors' ownerships. These changes enable us to specifically examine the class of the board of directors and group of institutional investors that make firms use derivatives. The grey institutional investors are those institutional investors that have other business relations with the firms, which include financial institutions, who are market players in the derivative markets and would be interested in other businesses. The independent institutional investors are the opposite of the grey investors. We find strong evidence that institutional investors who do not have any other business relation with a firm other than investment, i.e., the independent investors, really monitor and influence activities to the extent that the firm uses derivatives. The key explanation for this finding is that the independent investors are more interested in maximising their wealth through the investment they make in the firm and would therefore prefer that the firm hedges to reduce any cash-flow volatility that would erode their wealth. Further, we find that the sign on the coefficient of geographical diversification is changed to positive, suggesting that geographical diversification has a positive effect on firms' decision to hedge (coefficient of 0.0120).

There is anecdotal evidence that shocks to macroeconomic conditions influence corporate hedging policy. A survey conducted by JP Morgan Chase and co., reveals that at the looming of a financial crisis, firms around the world increase their hedging to protect themselves against volatility, while they reduce their hedging activities during the financial crisis

(Schoenberger 2011). In another vein, Strauss (2014) reports that corporate hedging activities decline in periods when the macroeconomic environment is relatively stable. In model 9, we show how macroeconomic conditions influence corporate hedging decisions. We re-estimate model 5. However, we replace time effect dummies with macroeconomic dummies. We define the period before a financial crisis as a binary value that equals 1, the financial crisis period takes the value of 2 and the period after the financial crisis takes the value of 3. Our finding is qualitatively similar to that in model 5.

In sum, this section shows that leverage, capital expenditure, firm size, dividend pay-out, foreign exchange exposure and independent institutional owners have positive influence on a firm's propensity to hedge with derivatives over 2005-2011. We also find that market to book ratio has an effect on derivatives usage decisions. These results suggest that the expected costs of financial distress, underinvestment costs, ownership structure, firm size, presence of hedging substitutes and exposure to foreign exchange exposure have non-trivial effects on a firm's propensity to hedge with derivatives. Following our findings above, we then proceed to the next section to examine the factors that make firms use derivatives in different macroeconomic conditions.

Table 2:4: Pooled Logistic regressions for hedging decisions: whole sample period.

This table presents the marginal effects and robust standard errors from the logistic regressions of the incentives for derivatives usage. The dependent variable, a dummy variable that takes the value of one if a firm hedges with financial derivative instruments (Foreign currency, interest rate and/or commodity) and 0 otherwise is regressed on several predictors and control variables. Our set of control variables are systematically varied by individually adding to and deleting them from the models. Model 1 is our baseline model. Model 2 investigates the effect of business risks (cash-flow volatility and industry diversification) on hedging decisions. Model 3 investigates the effect of market risk (interest cover, FOREX_exposure and geographical diversification) on hedging decisions. Model 4 examines the effect of agency problem (Assets utilisation and intangibility) on hedging decisions. In model 5, we investigate the role of ownership structure on hedging decisions by including our broad ownership variables (Board_Owners and TOT_Ins_Owners). In model 6, we re-estimated the model sp0ecified in model 5 but exclude the Assets utilisation variable. In model 7, we examine the nonlinear effect of ownership structure on hedging decisions. In model 8, we replace our broad classification of ownership structure with more specific proxies of ownership: Non_Exec_Owners and CEO_CFO for Board_Owners and Grey_Owners and Indep_Ownes for TOT_Ins_Owners, to examine the type of owners that influence hedging decisions. In model 9, we specifically investigate our macroeconomic conditions influences firms' hedging decisions by replacing time effect dummies in previous models with macroeconomic dummies. Robust standard errors are obtained by clustering at the firm-level and reported in parentheses. *, ** and *** indicate significance at the 10%, 5% and 1% levels respectively. LR (likelihood ratio) $Chi^2(2)$ is a joint test to test the null hypothesis that the coefficients on the foreign exchange exposure and geographical diversification are zero. Definitions of other variables are presented in Appendix 2.3.

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Leverage	**0.4959*** **	**0.5088*** **	**0.4832*** **	**0.5083*** **	**0.5116*** **	**0.4947*** **	**0.5005*** **	**0.5221*** **	**0.5114*** **
	(0.1197)	(0.1310)	(0.1234)	(0.1232)	(0.1225)	(0.1232)	(0.1235)	(0.1238)	(0.1225)
Market to book	-0.0284	**-0.0498***	**-0.0503****	**-0.0529****	**-0.0656*** **	**-0.0675*** **	**-0.0692*** **	**-0.0657*** **	**-0.0650*** **
	(0.0267)	(0.0255)	(0.0252)	(0.0250)	(0.0248)	(0.0252)	(0.0246)	(0.0250)	(0.0236)
CAPX	0.5902	0.8140	0.8231	**1.3862****	**1.4286****	**1.3191****	**1.4275****	**1.4385****	**1.4216****
	(0.6246)	(0.6814)	(0.6330)	(0.6456)	(0.6352)	(0.6463)	(0.6397)	(0.6338)	(0.6334)
Tax	0.8473	0.8239	0.6756	0.5782	0.7298	0.8223	0.7751	0.6850	0.7056
	(0.5516)	(0.5834)	(0.5821)	(0.5820)	(0.5933)	(0.6034)	(0.5915)	(0.5971)	(0.5916)
Liquidity	0.0237	0.0227	0.0130	0.0365	0.0304	0.0218	0.0274	0.0346	0.0304
	(0.0336)	(0.0345)	(0.0325)	(0.0314)	(0.0320)	(0.0329)	(0.0332)	(0.0319)	(0.0318)
Dividend_payout	**0.9490***	0.9131	0.8585	0.8391	0.8207	0.8716	0.8301	0.8109	0.8204
	(0.5533)	(0.5792)	(0.5486)	(0.5500)	(0.5644)	(0.5687)	(0.5841)	(0.5552)	(0.5621)
Size	**0.1006*** **	**0.1040*** **	**0.0944*** **	**0.0953*** **	**0.0800*** **	**0.0778*** **	**0.0772*** **	**0.0797*** **	**0.0800*** **
	(0.0112)	(0.0124)	(0.0125)	(0.0119)	(0.0136)	(0.0142)	(0.0139)	(0.0140)	(0.0136)
Cf_Vol		0.2770	0.2047	0.2660	0.2608	0.2382	0.2467	0.2782	0.2541
		(0.3802)	(0.3639)	(0.3645)	(0.3567)	(0.3602)	(0.3611)	(0.3563)	(0.3558)
Industry_divers		-0.0128	-0.0195	-0.0254	-0.0320	-0.0313	-0.0296	-0.0319	-0.0317
		(0.0433)	(0.0441)	(0.0444)	(0.0440)	(0.0441)	(0.0444)	(0.0443)	(0.0440)
Interest Cover			0.0005	0.0005	0.0009	0.0010	0.0008	0.0008	0.0009
			(0.0016)	(0.0016)	(0.0016)	(0.0016)	(0.0016)	(0.0016)	(0.0016)
FOREX_Exposure			**0.1918****	**0.1693****	**0.1458****	**0.1550****	**0.1470****	**0.1321***	**0.1458****
			(0.0745)	(0.0736)	(0.0723)	(0.0732)	(0.0727)	(0.0698)	(0.0725)
Geo_dummy			-0.0201	-0.0101	-0.0004	-0.0064	0.0022	0.0120	-0.0006
			(0.0620)	(0.0637)	(0.0630)	(0.0619)	(0.0651)	(0.0616)	(0.0631)

Intangibility				0.1519	0.1193	0.0872	0.1152	0.1342	0.1192
				(0.0956)	(0.0953)	(0.0901)	(0.0941)	(0.0971)	(0.0953)
Assets_utilisation				0.0237	0.0193		0.0187	0.0201	0.0189
				(0.0242)	(0.0238)		(0.0238)	(0.0236)	(0.0238)
Board_Owners					-0.0061	0.0013	0.2117		-0.0049
					(0.0974)	(0.0974)	(0.3134)		(0.0972)
Board_Owners^2							-0.1976		
							(0.2627)		
Non_Exec_Owners								-0.0946	
								(0.1201)	
CEO_CFO								0.0017	
								(0.1384)	
TOT_Ins_Owners					**0.1251***	**0.1332***	0.0493		**0.1266***
					(0.0718)	(0.0735)	(0.2620)		(0.0718)
TOT_Ins_Owners^2							0.0864		
							(0.3022)		
Indep_Owners								**0.1223***	
								(0.0720)	
Grey_Owners								-0.0290	
								(0.1417)	
Industry dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
Macroeconomic dummies	No	No	No	No	No	No	No	No	Yes
Constant	**-16.5148*** **	**-16.6406*** **	**-16.7862*** **	**-18.0314*** **	**-15.9251*** **	**-15.2226**	**-15.3867**	**-15.9815*** **	**-15.7644*** **
	(2.5661)	(2.7917)	(2.5184)	(2.4169)	(2.4825)	(2.6552)	(2.5966)	(2.5485)	(2.4817)
Log likelihood	-724.7685	-676.1364	-645.8586	-639.991	-633.8183	-635.2063	-632.871	-632.7091	-634.484
Pseudo R-squared	0.4049	0.4036	0.4303	0.4352	0.4407	0.4394	0.4415	0.4416	0.4401
Number of observations	1,836	1,698	1,698	1,697	1,697	1,697	1,697	1,697	1,697
Number of firms	264	244	244	244	244	244	244	244	244
LR Chi^2 (2)			**60.30*** **					**38.64*** **	
Area under the ROC curve	0.8921	0.8917	0.900	0.9016	0.9039	0.9034	0.9045	0.9042	0.9036

2.4.3.2: Logistics regressions for a firm's propensity to hedge with derivatives based on the prevailing macroeconomic conditions

In this section, we use the natural experience of the financial crisis to study a firm's propensity to hedge with derivatives. We divide our sample period into three based on the prevailing macroeconomic situation. We categorise 2005-2007 as the pre-financial crisis period. The period of 2008-2009 is classified as the financial crisis; while 2010-2011 is the post-financial crisis period. The crisis period is set to 2008-2009 because of the following reasons. First, there was volatility in the foreign exchange market in the second half of 2007 that led to a sharp increase in the annualised rate of depreciation of international currencies in 2008, which may have increased the costs of transactions for MNCs. For example, the annualised rate of depreciation of the US Dollar against the Euro increased from 9 per cent between 2006 and the first half of 2007 to around 20 per cent between July 2007 and April 2008 (Bank for International Settlement, 2008a). Second, there was dysfunctionality in the larger part of the global financial markets between June 2007 and May 2008, to the extent that firms experienced severe credit constraints (Bank for International Settlement, 2008b). Finally, since the crisis began in the second half of 2007, the effects may not be observable until the end of financial year 2008.

This section of the study is important for several reasons. First, it is argued in previous empirical literature that firms' leverage level (leverage is our proxy for expected financial distress costs) is influenced by the prevailing macroeconomic situation (Bernanke and Gertler 1989; Choe et al. 1993; Dang 2013; Kiyotaki and Moore 1997; Korajczyk and Levy 2003). For example, it is argued from the demand side that firms use less leverage during economic growth than they do during financial crisis (i.e., counter-cyclical) because there is less uncertainty, more investment opportunity and high adverse selection costs (Choe et al. 1993; Korajczyk and Levy 2003). Graham et al. (2011) find that a one standard deviation increase in leverage increases the probability of encountering financial distress by 31 per cent during the 2008-2009 financial crisis period.

From the supply side, firms use less leverage during financial crisis because of loss of net worth and collateral value (Bernanke and Gertler 1989 Kiyotaki and Moore 1997; Korajczyk and Levy 2003). Then, Rampini et al. (2014) argue that when a firm's net worth is low, it

focuses more on the financing needs of its valuable projects rather than hedging concerns. Second, some firms may find it more costly and/or difficult to obtain external capital at the markets during financial crisis because of tightened regulations and requirements and sometimes inefficiency on the part of the markets (Hoque 2013; Song and Lee 2012). Also, it is argued that managers find it difficult to accurately predict their firms' cash-flows during financial crisis, to the extent that they make decisions they would not have made otherwise (Bartram et al. 2011; Baum et al. 2006).

2.4.3.2.1: Logistics regressions for a firm's propensity to hedge with derivatives: Pre-crisis period

Table 2.5 presents the results from the pooled logistic regression analysis of a firm's propensity to use derivatives, for pre-crisis period. The table shows that most of our findings in Table 2.4 still hold true; however, the magnitude of the impacts of the variables differs. First, the coefficients on leverage in models 1 – 7 range from 0.4131 - 0.4351 and are statistically significant at the 1 per cent level. The results imply that a firm has about 0.4131 and 0.4351 chances of using derivatives when its expected costs of financial distress increase by one per cent, in the pre-financial crisis period. Second, the coefficient on liquidity flips sign and becomes negative but statistically insignificant; while the positive coefficient on dividend pay-out is become economically stronger. The findings provide clear support for the hedging substitute argument that firms that can use their internally generated resources as hedging substitutes would not be likely to hedge. Third, we find an insignificant positive association between geographical diversification and derivatives usage. This is consistent with the notion that the internationalisation of businesses motivates firms to hedge to protect themselves from foreign exchange fluctuations. Next, the coefficient on chief executive and chief finance officers' shareholdings (CEO_CFO) and that of the non-executive shareholdings is positive, although insignificant. Also, the coefficients on independent and grey institutional investors' ownerships are both positive, but significant only for independent ownerships at the 5 per cent level. These provide evidence that both insiders and institutional investors have a preference for hedging when macroeconomic certainty is high. Next, we find out the motivating factors for derivatives usage when the macroeconomic situation is unfavourable, during a financial crisis.

Table 2:5: Pooled Logistic regressions for hedging decisions: pre-financial crisis period

This table presents the marginal effects and robust standard errors from the logistic regressions of the incentives for derivatives usage. The dependent variable is a dummy variable that takes the value of one if a firm hedges with financial derivative instruments (foreign currency, interest rate and/or commodity) and 0 otherwise. Model 1 is our baseline model. Model 2 investigates the effect of business risks (cash-flow volatility and industry diversification) on hedging decisions. Model 3 investigates the effect of market risk (interest cover, FOREX_exposure and geographical diversification) on hedging decisions. Model 4 examines the effect of agency problem (Assets utilisation and intangibility) on hedging decisions. In model 5, we investigate the role of ownership structure on hedging decisions by including our broad ownership variables (Board_Owners and TOT_Ins_Owners). In model 6, we examine the nonlinear effect of ownership structure on hedging decisions. In model 7, we replace our broad classification of ownership structure with more specific proxies of ownership: Non_Exec_Owners and CEO_CFO for Board_Owners and Grey_Owners and Indep_Owners for TOT_Ins_Owners, to examine the type of owners that influence hedging decisions. Robust standard errors are obtained by clustering at the firm-level and reported in parentheses. *, ** and *** indicate significance at the 10%, 5% and 1% levels respectively. Definitions of other variables are presented in Appendix 2.3.

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Leverage	**0.4525*** **	**0.4175*** **	**0.4131*** **	**0.4351*** **	**0.4239*** **	**0.4142*** **	**0.4237*** **
	(0.1177)	(0.1261)	(0.1247)	(0.1281)	(0.1215)	(0.1217)	(0.1205)
Market to book	-0.0274	**-0.0520***	-0.0491	-0.0515	**-0.0644****	**-0.0696****	**-0.0624***
	(0.0309)	(0.0295)	(0.0309)	(0.0317)	(0.0324)	(0.0321)	(0.0327)
CAPX	**1.5093****	**2.0309*** **	**1.8943*** **	**2.1864*** **	**2.2838*** **	**2.2672*** **	**2.2717*** **
	(0.7126)	(0.7738)	(0.7172)	(0.7423)	(0.7330)	(0.7439)	(0.7325)
Tax	0.1475	0.2031	-0.0035	-0.1271	-0.0913	-0.0385	-0.1752
	(0.6701)	(0.7013)	(0.7723)	(0.7862)	(0.7795)	(07992)	(0.7665)
Liquidity	-0.0014	-0.0167	-0.0181	-0.0024	-0.0119	-0.0140	-0.0087
	(0.0386)	(0.0402)	(0.0358)	(0.0394)	(0.0389)	(0.0395)	(0.0400)
Dividend_payout	**1.6259*** **	**1.6383*** **	**1.5796*** **	**1.5666*** **	**1.6067*** **	**1.6229*** **	**1.6140*** **
	(0.5748)	(0.6241)	(0.5669)	(0.5698)	(0.5879)	(0.6077)	(0.5834)
Size	**0.1020*** **	**0.1027*** **	**0.0956*** **	**0.0963*** **	**0.0836*** **	**0.0802*** **	**0.0862*** **
	(0.0120)	(0.0120)	(0.0116)	(0.0114)	(0.0138)	(0.0139)	(0.0149)
CF_Vol		0.6087	0.4005	0.4551	0.4920	0.5033	0.4796
		(0.4876)	(0.4902)	(0.4942)	(0.4825)	(0.4907)	(0.4827)
Industry_divers		0.0073	0.0009	-0.0049	-0.0117	-0.0085	-0.0088
		(0.0496)	(0.0491)	(0.0498)	(0.0496)	(0.0496)	(0.0503)
Interest_cover			-0.0003	-0.0002	0.0003	0.0004	0.0004
			(0.0025)	(0.0025)	(0.0026)	(0.0026)	(0.0025)
FOREX_Exposure			**0.1553***	**0.1461***	**0.1395***	**0.1418***	**0.1335***
			(0.0826)	(0.0820)	(0.0826)	(0.0839)	(0.0792)

Geo_Exposure			0.0277	0.0367	0.0314	0.0328	0.0357
			(0.0786)	(0.0794)	(0.0781)	(0.0792)	(0.0732)
Intangibility				0.0838	0.0465	0.0437	0.0577
				(0.1123)	(0.1127)	(0.1131)	(0.1152)
Assets_Utilisation				0.0202	0.0116	0.0107	0.0130
				(0.0263)	(0.0249)	(0.0250)	(0.0249)
Board_Owners					0.0843	0.3089	
					(0.1118)	(0.3260)	
Board_Owners^2						-0.1998	
						(0.2798)	
Non_Exec_Owners							0.0302
							(0.1338)
CEO_CFO							0.1565
							(0.1308)
TOT_Ins_Owners					**0.1430***	0.0765	
					(0.0761)	(0.2846)	
TOT_Ins_Owners^2						0.0777	
						(0.3309)	
Indep_Owners							**0.1341***
							(0.0776)
Grey_Owners							0.0028
							(0.1531)
Industry dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	**-16.8279*** **	**-16.5801*** **	**-17.3925*** **	**-18.2209*** **	**-16.5723*** **	**-15.9239*** **	**-17.0932*** **
	(2.9347)	(2.9228)	(2.7648)	(2.7596)	(2.9577)	(2.9577)	(3.2015)
Pseudo R-squared	0.4335	0.4360	0.4634	0.4659	0.4727	0.4735	0.4742
Log likelihood	-302.5027	-279.6239	-266.0295	-264.4682	-261.1075	-260.7019	-260.3655
Number of observations	786	726	726	725	725	725	725
Number of firms	264	244	244	244	244	244	244
Area under the ROC curve	0.8835	0.8803	0.8903	0.8920	0.8939	0.8943	0.8933

2.4.3.2.2: Logistics regressions for a firm's propensity to hedge with derivatives: Financial crisis period

We now turn to Table 2.6 to examine the motives for derivatives usage during a financial crisis. In comparison with the results in Table 2.5, there are some noticeable differences. First, we find that only leverage, firm size and foreign exchange exposure retain their statistical significance as in Table 2.5 (except that their economic significance differs). The effect of expected costs of financial distress on derivatives usage is economically larger during a financial crisis. A one per cent increase in the likelihood of encountering financial distress leads to about 0.543 to 0.651 chances of hedging with derivatives during a financial crisis. The implication of this finding is that, since leverage is counter-cyclical, then expected costs of financial distress may be higher during a financial crisis, which would increase the incentive to hedge (Choe et al. 1993; Graham et al. 2011; Korajczyk et al. 1990). Also, this finding provides empirical support for Almeida et al's (2004) suggestion that financially distressed firms have greater propensity to hedge during a financial market meltdown. Also, the coefficient on tax liability has changed sign; it is significantly positive at the 5 per cent level. This indicates that tax liability has a significant influence on a firm's hedging decision during a financial crisis. This is consistent with the explanations that there is a correlation between tax liability and financial constraints, and that financial constraints may be severe during a financial crisis, which would accentuate the investment-tax liability sensitivity (Fazzari et al. 1988).

Second, the coefficient on grey institutional ownership has changed sign, and become negative, although it is not significant. Our interpretation for the negative effect is that lower ownership of the grey investors may influence a firm's decisions to use derivatives during a financial crisis. This is not too surprising, but it is interesting, because grey investors, particularly banks, may not monitor or pressure management to pursue value-maximising policies due to their business ties with the firms. However, their expertise in the derivatives markets may supersede their fraction of ownerships during a financial crisis.

Third, we find that the coefficient on a firm's exposure to geographical diversification is negative, ranging from 6.22 to 9.3. This implies that firms that diversify into other geographical regions have between 6.2 and 9.3 per cent lower probability of hedging with derivatives. A potential reason for such a finding is that a geographically diversified firm may

use its presence at another location to transact business on its behalf and in the local currency where it carries out the business, thereby mitigating its foreign exchange exposure. Also, there is a possibility that rather than pool funds from different geographical locations, which would have necessitated hedging due to the Group's exposure to exchange risk, businesses are allowed to obtain financing at the different capital markets, with which they are able to fund valuable projects. Further, considering the online business, it is possible that a local business hedges to reduce its exposure to international trading during a financial crisis. Next, we find weak evidence that both the chief executive and chief finance officers' (CEO_CFO) and non-executives' ownerships have negative influence on derivatives usage during a crisis. Our interpretations of those results are similar to those provided in Section 2.5.3.1.

2.4.3.2.3: Logistics regressions for a firm's propensity to hedge with derivatives: post-crisis period

In Table 2.7, we examine the motives for corporate derivatives use after a financial crisis. Compared with the previous results, we observe some changes. As shown in the table, information asymmetry has a positive and significant association with a firm's decision to hedge after a financial crisis. Also, in economic terms, we find that a firm has about 0.574 to 0.696 chance of using derivatives when expected financial distress costs increase by one per cent.

In sum, the results in this section reveal that the factors that motivate a firm's hedging decision during the three different macroeconomic conditions, i.e., pre-financial, during a financial crisis and post financial crisis, are not similar. We find evidence that the likelihood of facing financial distress has smaller influence on derivative usage during a financial crisis than before and after a crisis.

Table 2:6: Pooled Logistic regressions for hedging decisions: financial crisis period

This table presents the marginal effects and robust standard errors from the logistic regressions of the incentives for derivatives usage. The dependent variable is a dummy variable that takes the value of one if a firm hedges with financial derivative instruments (foreign currency, interest rate and/or commodity) and 0 otherwise. Model 1 is our baseline model. Model 2 investigates the effect of business risks (cash-flow volatility and industry diversification) on hedging decisions. Model 3 investigates the effect of market risk (interest cover, FOREX_exposure and geographical diversification) on hedging decisions. Model 4 examines the effect of agency problem (Assets utilisation and intangibility) on hedging decisions. In model 5, we investigate the role of ownership structure on hedging decisions by including our broad ownership variables (Board_Owners and TOT_Ins_Owners). In model 6, we examine the nonlinear effect of ownership structure on hedging decisions. In model 7, we replace our broad classification of ownership structure with more specific proxies of ownership: Non_Exec_Owners and CEO_CFO for Board_Owners and Grey_Owners and Indep_Owners for TOT_Ins_Owners, to examine the type of owners that influence hedging decisions. Robust standard errors are obtained by clustering at the firm-level and reported in parentheses. *, ** and *** indicate significance at the 10%, 5% and 1% levels respectively. Definitions of other variables are presented in Appendix 2.3.

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Leverage	**0.5430*** **	**0.5882*** **	**0.5785*** **	**0.5883*** **	**0.6090*** **	**0.5820*** **	**0.6512*** **
	(0.1390)	(0.1560)	(0.1493)	(0.1538)	(0.1536)	(0.1597)	(0.1576)
Market to book	-0.0356	-0.0552	-0.0531	-0.0521	**-0.0607***	**-0.0676** **	**-0.0588***
	(0.0347)	(0.0339)	(0.0328)	(0.0331)	(0.0331)	(0.0333)	(0.0334)
CAPX	-0.0019	0.0288	-0.0485	0.4930	0.5285	0.5899	0.5846
	(0.7010)	(0.7517)	(0.7381)	(0.8575)	(0.8608)	(0.8685)	(0.8631)
Tax	**1.6535** **	**1.6023** **	**1.7619** **	**1.6761** **	**1.8435** **	**1.9846** **	**1.8240** **
	(0.6743)	(0.7670)	(0.7405)	(0.7382)	(0.7712)	(0.8110)	(0.7792)
Liquidity	0.0353	0.0433	0.0389	0.0553	0.0557	0.0505	**0.0625***
	(0.0373)	(0.0391)	(0.0374)	(0.0362)	(0.0373)	(0.0384)	(0.0366)
Dividend_payout	0.9782	0.9706	0.8576	0.8296	0.7357	0.7195	0.6558
	(0.6575)	(0.6769)	(0.6164)	(0.6206)	(0.5979)	(0.6315)	(0.5804)
Size	**0.0975*** **	**0.1005*** **	**0.0916*** **	**0.0918*** **	**0.0802*** **	**0.0740*** **	**0.0761*** **
	(0.0128)	(0.0146)	(0.0150)	(0.0145)	(0.0163)	(0.0168)	(0.0163)
CF_VOL		-0.0086	0.0276	0.0510	0.0544	-0.0467	0.0404
		(0.5870)	(0.5574)	(0.5580)	(0.5570)	(0.5797)	(0.5577)
Industry_divers		0.0055	0.0051	-0.0003	-0.0066	-0.0030	-0.0095
		(0.0502)	(0.0530)	(0.0526)	(0.0525)	(0.0532)	(0.0521)
Interest_cover			-0.0004	-0.0003	-0.0003	-0.0009	-0.0002
			(0.0026)	(0.0026)	(0.0025)	(0.0026)	(0.0025)
FOREX_Exposure			**0.2298*** **	**0.2050** **	**0.1782** **	**0.1744** **	**0.1732** **
			(0.0863)	(0.0850)	(0.0825)	(0.0822)	(0.0793)

GEO_divers			-0.0928	-0.0834	-0.0682	-0.0580	-0.0622
			(0.0621)	(0.0641)	(0.0649)	(0.0669)	(0.0620)
Intangibility				0.1269	0.1094	0.1054	0.1189
				(0.1122)	(0.1104)	(0.1125)	(0.1115)
Assets_utilisation				0.0147	0.0147	0.0152	0.0155
				(0.0280)	(0.0283)	(0.0281)	(0.0283)
Board_Owners					-0.0624	0.4384	
					(0.1080)	(0.4175)	
Board_Owners^2						-0.4662	
						(0.3634)	
Non_Exec_Owners							-0.0778
							(0.1304)
CEO_CFO							-0.2000
							(0.1643)
TOT_Ins_Owners					0.0782	-0.1091	
					(0.0846)	(0.3656)	
TOT_Ins_Owners^2						0.2124	
						(0.4032)	
Indep_Owners							0.0840
							(0.0847)
Grey_Owners							-0.1140
							(0.2291)
Industry dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	**-16.6057*** **	**-16.8277*** **	**-16.8229*** **	**-17.8172*** **	**-16.1622*** **	**-14.9975*** **	**-15.9102*** **
	(2.9224)	(3.2959)	(3.0952)	(3.0080)	(3.0410)	(3.2600)	(3.0355)
Pseudo R-squared	0.4252	0.4265	0.4535	0.4567	0.4604	0.4653	0.4653
Log likelihood	-196.5139	-182.5233	-173.9299	-172.904	-171.7233	-170.1812	-170.1863
Number of observations	525	485	485	485	485	485	485
Number of firms	264	244	244	244	244	244	244
Area under the ROC curve	0.8884	0.8875	0.8942	0.8956	0.8969	0.897	0.896

Table 2:7: Pooled Logistic regressions for hedging decisions: post-crisis period.

This table presents the marginal effects and robust standard errors from the logistic regressions of the incentives for derivatives usage. The dependent variable is a dummy variable that takes the value of one if a firm hedges with financial derivative instruments (foreign currency, interest rate and/or commodity) and 0 otherwise. Model 1 is our baseline model. Model 2 investigates the effect of business risks (cash-flow volatility and industry diversification) on hedging decision. Model 3 investigates the effect of market risk (interest cover, FOREX_exposure and geographical diversification) on hedging decisions. Model 4 examines the effect of agency problem (Assets utilisation and intangibility) on hedging decisions. In model 5, we investigate the role of ownership structure on hedging decisions by including our broad ownership variables (Board_Owners and TOT_Ins_Owners). In model 6, we examine the nonlinear effect of ownership structure on hedging decisions. In model 7, we replace our broad classification of ownership structure with more specific proxies of ownership: Non_Exec_Owners and CEO_CFO for Board_Owners and Grey_Owners and Indep_Owners for TOT_Ins_Owners, to examine the type of owners that influence hedging decisions. Robust standard errors are obtained by clustering at the firm-level and reported in parentheses. *, ** and *** indicate significance at the 10%, 5% and 1% levels respectively. Definitions of other variables are presented in Appendix 2.3.

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Leverage	**0.5741*** **	**0.6193*** **	**0.5607*** **	**0.6166*** **	**0.6421*** **	**0.6543*** **	**0.6958*** **
	(0.2026)	(0.2278)	(0.2125)	(0.2066)	(0.2078)	(0.2168)	(0.2118)
Market to book	-0.0008	-0.0196	-0.0301	-0.0337	-0.0527	-0.0505	-0.0489
	(0.0353)	(0.0351)	(0.0335)	(0.0342)	(0.0358)	(0.0356)	(0.0350)
CAPX	-0.3084	-0.1926	-0.1903	0.7883	0.7823	0.7851	0.8909
	(0.8404)	(0.8649)	(0.8258)	(0.8321)	(0.8408)	(0.8454)	(0.8527)
Tax	1.0400	0.9631	0.6710	0.6315	0.8848	0.8761	0.7385
	(0.8275)	(0.8873)	(0.8705)	(0.8935)	(0.9260)	(0.9162)	(0.8988)
Liquidity	0.0479	0.0568	0.0325	**0.0766***	0.0753	0.0753	**0.0903** **
	(0.0441)	(0.0456)	(0.0454)	(0.0451)	(0.0461)	(0.0495)	(0.0460)
Dividend_payout	-0.2982	-0.3656	-0.3611	-0.4146	-0.4542	-0.4468	-0.5128
	(0.9542)	(0.9888)	(0.9543)	(0.9825)	(1.0473)	(1.0450)	(1.0344)
Size	**0.1015*** **	**0.1094*** **	**0.0936*** **	**0.0975*** **	**0.0763*** **	**0.0769*** **	**0.0774*** **
	(0.0141)	(0.0165)	(0.0169)	(0.0163)	(0.0200)	(0.0204)	(0.0195)
CF_VOL		0.2228	0.2177	0.4025	0.3242	0.3327	0.4241
		(0.6159)	(0.5989)	(0.5845)	(0.5631)	(0.5628)	(0.5523)
Industry_divers		-0.0523	-0.0571	-0.0568	-0.0655	0.0669	-0.0676
		(0.0503)	(0.0521)	(0.0520)	(0.0512)	(0.0515)	(0.0509)
Interest_cover			0.0029	0.0029	0.0033	0.0033	0.0026
			(0.0024)	(0.0025)	(0.0025)	(0.0025)	(0.0025)
FOREX_Exposure			**0.2451*** **	**0.1879** **	0.1564	0.1529	0.1161
			(0.0930)	(0.0934)	(0.0970)	(0.0954)	(0.0915)
GEO_dummy			-0.0620	-0.0422	-0.0301	-0.0282	0.0109
			(0.0719)	(0.0740)	(0.0811)	(0.0834)	(0.0841)

Intangibility				**0.2786***	**0.2341****	**0.2294****	**0.2792****
				(0.1108)	(0.1102)	(0.1112)	(0.1106)
Assets_utilisation				0.0336	0.0290	0.0286	0.0303
				(0.0278)	(0.0279)	(0.0281)	(0.0278)
Board_Owners					-0.0508	-0.1299	
					(0.1057)	(0.4095)	
Board_Owners_Squared						0.0804	
						(0.3587)	
Non_Exec_Owners							-0.1992
							(0.1230)
CEO_CFO							-0.0138
							(0.1805)
TOT_Ins_Owners					0.1446		
					(0.1057)		
TOT_Ins_Owners_Squared						0.0778	
						(0.4128)	
Indep_Owners						0.0862	0.1598
						(0.4789)	(0.1101)
Grey_Owners							-0.2844
							(0.3317)
Industry dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	**-16.7588*****	**-17.8527*****	**-16.9971*****	**-19.8976*****	**-16.7659*****	**-17.1889*****	**-17.6706*****
	(3.0618)	(3.5339)	(3.3368)	(3.4211)	(3.5401)	(3.6661)	(3.5059)
Pseudo R-squared	0.3790	0.3827	0.4150	0.4308	0.4383	0.4387	0.4451
Log likelihood	-209.6113	-194.4818	-184.3052	-179.3291	-176.9550	-176.8292	-174.8050
Number of observations	525	487	487	487	487	487	487
Number of firms	264	244	244	244	244	244	244
Area under the ROC curve	0.8844	0.8841	0.8898	0.8899	0.8916	0.8909	0.8898

2.5: Robustness Checks

In this subsection, we summarise the results of the additional tests conducted to verify the robustness of our earlier empirical findings. We focus on the relationship between derivative usage and the probability of financial distress costs therefore, and thus employ KZ-index as an alternative proxy to measure expected costs of financial distress as well as financial constraint. KZ index is measured as $-1.002X_1 + 0.283X_2 + 3.139X_3 - 39.368X_4 - 1.315X_5$, where X_1 is cash-flow, X_2 is the market to book ratio, X_3 is the leverage, X_4 is dividends and X_5 is cash-holding. The models we estimate in this section are similar to those in section 2.5.1, except that we exclude all variables that are in our computation of KZ-index: leverage, market to book, cash-flow volatility, quick ratio, dividend pay-out and dividend dummy. Also, we drop the tax liability and interest cover variables because they may be correlated with financial constraints (Fazzari et al. 1988; Kaplan and Zingales 1997b). For example, Kaplan and Zingales (1997b) argue that a firm that has a healthy interest cover may have very large investment-cash flow sensitivity. The models have industry and time dummies to account for the effects of different industries that firms operate in and effects of different years. The results of the pooled logistic estimations are presented in Appendix 2.5.

The results obtained from the models are not qualitatively different from the main empirical findings of this chapter, except KZ-index is unexpectedly positive in models 1 – 8. Also, the coefficient on capital expenditure is positive throughout the models, however, it is economically and statistically significant in the whole sample and pre-financial crisis periods only.

2.6: Sensitivity Analysis

In this section, we carry out sensitivity tests based on the results from model 5 of Tables 2.5 and 2.6. We plot the sensitivity of hedging decisions on several firm characteristics including the expected costs of financial distress (leverage), underinvestment problem (capital expenditure), market risk (cash-flow volatility), tax liability, board of directors' and total institutional investors ownership under two different macroeconomic conditions: per-crisis (sample period of 2005-2007) and during a financial crisis (sample period of 2008-2009) periods. The graphs allow us to show the impact of percentage change in firm-specific

characteristics on percentage change in hedging decisions while comparing our findings in the two sub-periods.

Fig. 2.1.a shows the impact of percentage change in expected costs of financial distress (leverage) on percentage change in hedging decisions for the two sub-periods. Overall, the shows that holding all other variables constant, the probability of hedging reduces as the expected costs of financial distress (leverage) increases in both sub-periods. We observe that the probability that a firm would hedge increases slightly when expected costs of financial distress increase from 5 per cent to 20 per cent in the pre-crisis but gradually decreases as expected cost of financial distress increases. Specifically, the likelihood of hedging in the period before a financial crisis reduces by about 13.55 per cent when expected cost of financial distress increases from 10 to 60 per cent. On the other hand, the chance that a UK firm would use derivatives during a financial crisis consistently decreases, until it is almost lost completely at a very high level of expected cost of financial distress.

In Fig. 2.1.b, we show the impact of percentage change in growth options (CAPX) on percentage change in hedging decisions for the two sub-periods. We find that the probability that a firm would hedge as growth opportunity increases seems relatively stable during normal macroeconomic conditions but decreases during a financial crisis period. There is an L-shaped association between capital expenditure and propensity to hedge. As shown on the graph, a firm has about 2.94 per cent chance of hedging when it has small growth opportunity at 15 per cent, and about 1.08 per cent chance of hedging when growth increases to 80 per cent during a financial crisis, This finding suggests that firms with high-growth opportunities may not have cash-flow problems due to their ability to accurately predict cash-flows when macroeconomic conditions are calm. Thus, such firms rely more on internally generated funds - hedging substitutes such as cash and dividends, and therefore do not have need for hedging. Also, we interpret the findings in the figure that internally generated funds may be expensive during a financial crisis due to cash-flow volatility and it might be difficult to access external financing. Hence, both low and high-growth firms engage in hedging activities; however, high-growth firms have lower likelihood to hedge. This may be because high-growth firms are more likely to be larger and could access other financial markets.

In Fig 2.1.c, we show the impact of percentage change in cash-flow volatility on percentage change in hedging decisions for the two sub-periods. The figure shows that cash-flow is

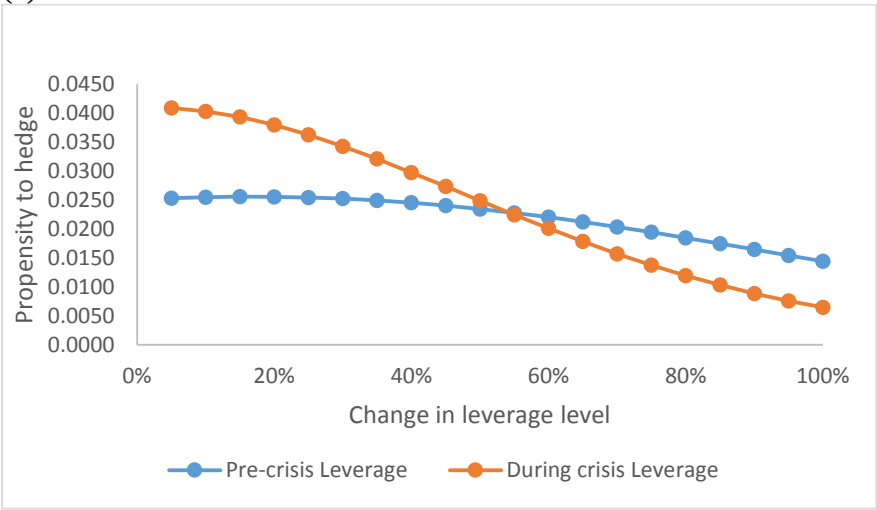
relatively stable during the normal period (pre-crisis) and as such, the propensity to hedge seems unchanged. However, our findings appear to be different during the financial crisis period. We find that our sample's cash-flow is volatile during the financial crisis. Specifically, when cash-flow volatility is at the lower end of the continuum (between 5 to 25 per cent), the propensity that our sampled firms would hedge with derivatives was high. However, as the volatility becomes intense at the highest end of the continuum, the probability of having a hedging policy becomes lower. These findings partly support existing theory that firms engage in hedging activities to mitigate cash-flow volatility. This is because the severity of cash-flow volatility during a financial crisis is associated with lower propensity to hedge.

In Fig 2.1.d, we examine the impact of percentage change in tax liability on percentage change in hedging decisions for the pre-crisis and financial crisis periods. As shown in Fig.2.1.d, tax liability does not induce a firm to hedge when the macroeconomic environment is certain. On the other hand, we find an L-shaped association between tax liability and propensity to hedge. When tax liability is low, a firm has high propensity to hedge. However, as tax liability increases to, for example, 40 per cent the probability of hedging becomes negligible. These findings corroborate our earlier explanation and suggest that, if tax liability could proxy for expected cost of financial distress, at a high level of financial distress a firm might not be able to hedge, particularly during a financial crisis.

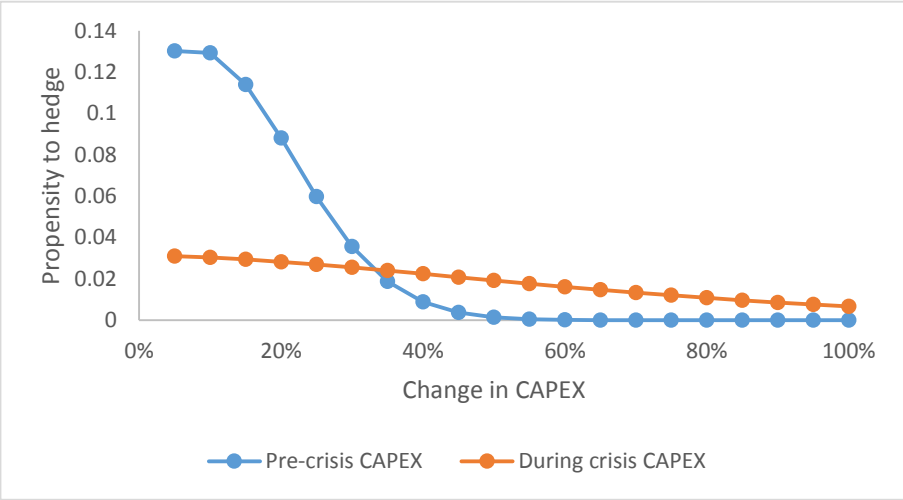
Looking at the sensitivity of hedging to percentage change ownership structure. Fig. 2.1.e shows how hedging decisions changes following percentage change in board of director's shareholdings. We find a positive and constituent association between insiders' ownership and a firm's propensity to use derivatives during normal macroeconomic conditions. In contrast, change in board of directors' ownership does not influence firms' hedging decisions during a financial crisis. Furthermore, we find in Fig.2.1.f institutional investor's shareholdings has a positive association with a firm's propensity to use derivatives during the two macroeconomic conditions. However, the impact of the variable on hedging seems different during the two sub-periods. A percentage change in institutional investors' shareholdings has greater impact on hedging policy during normal macroeconomic conditions than it does in the financial crisis period. This finding implies that institutional investors' ability to access corporate information, and to use the information to monitor and influence firms' policies, is supported by the prevailing macroeconomic conditions. This implies that institutional investors have a better chance to carry out their monitoring activities during a financial crisis because of financial

uncertainty. In sum, this section reveals that the factors that induce firms' hedging decisions in the pre-crisis and during a financial crisis periods are not the same.

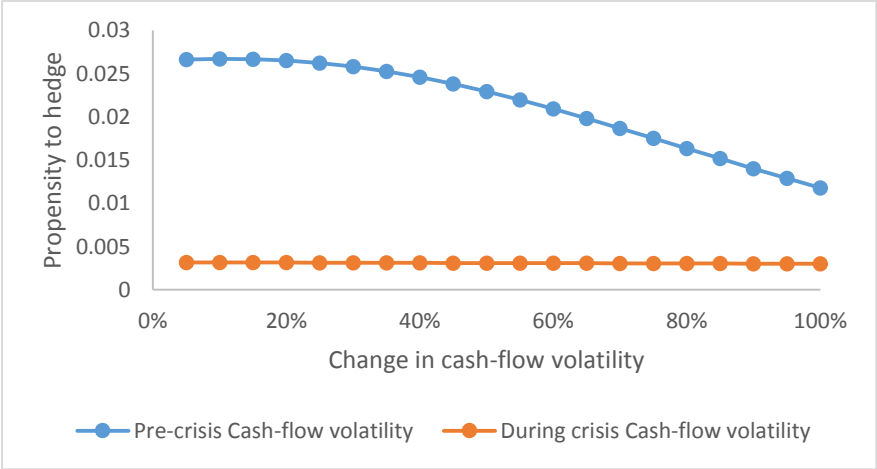
(a)


0.0450
0.0400
0.0350
0.0300
0.0250
0.0200
0.0150
0.0100
0.0050
0.0000
Propensity to hedge
0%
20%
40%
60%
80%
100%
Change in leverage level
Pre-crisis Leverage
During crisis Leverage

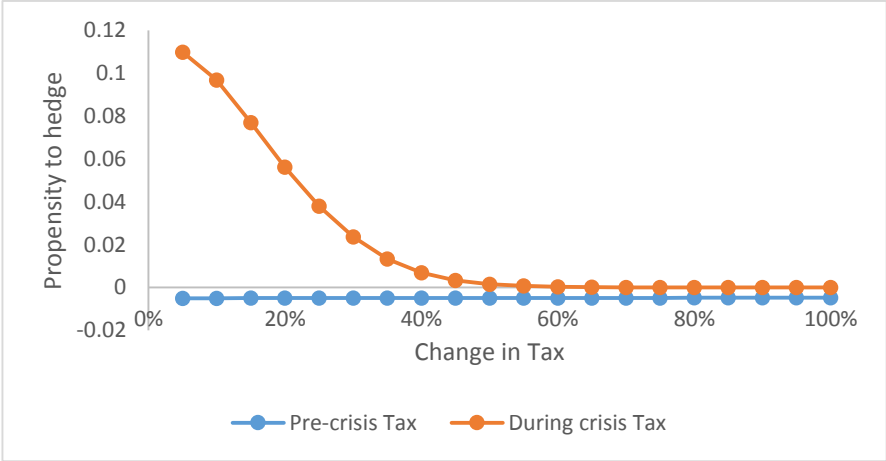
(b)


0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
Propensity to hedge
0%
20%
40%
60%
80%
100%
Change in CAPEX
Pre-crisis CAPEX
During crisis CAPEX

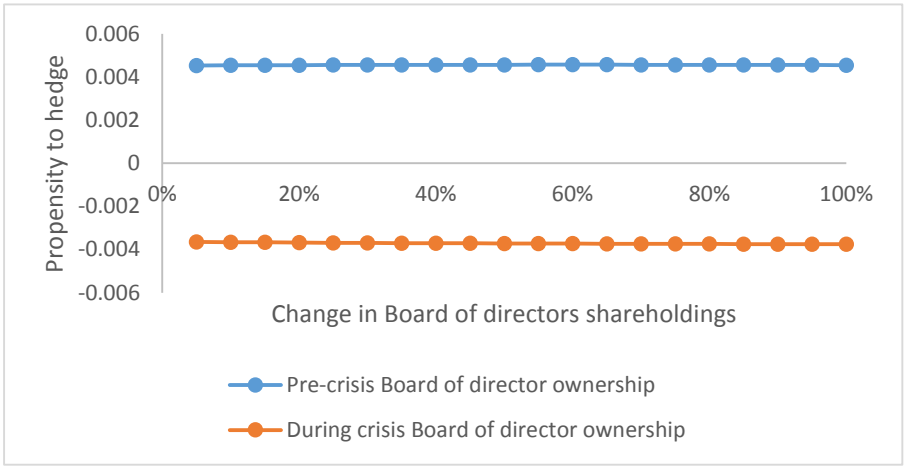
(c)


0.03
0.025
0.02
0.015
0.01
0.005
0
Propensity to hedge
0%
20%
40%
60%
80%
100%
Change in cash-flow volatility
Pre-crisis Cash-flow volatility
During crisis Cash-flow volatility

(d)


0.12
0.1
0.08
0.06
0.04
0.02
0
-0.02
Propensity to hedge
0%
20%
40%
60%
80%
100%
Change in Tax
Pre-crisis Tax
During crisis Tax

(e)



(f)

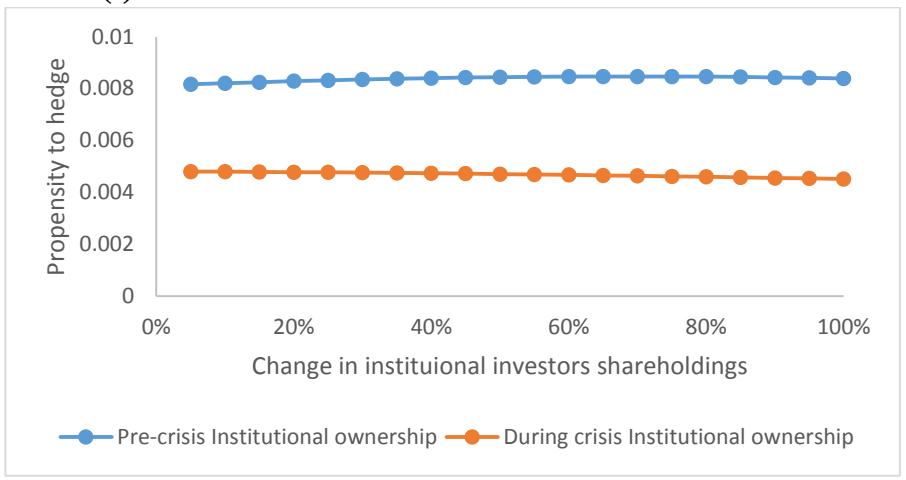


Figure 2:1The marginal effects of corporate hedging: comparison of pre-crisis and during financial crisis

2.7: Conclusion

Using panel data of financial derivative instruments and ownership structure of UK non-financial firms over 2005-2011, this chapter empirically investigates the incentives for corporate hedging. The extant literature suggests that firms hedge to mitigate cash-flow volatility arising from expected financial distress, tax liability, underinvestment costs, and agency costs. Even though several empirical studies have been conducted, the findings on the theories are mixed so far. This chapter, motivated by the natural experience of the 2008 financial crisis, attempts to contribute to the existing knowledge by investigating the rationales for hedging, and proffering answers to two main questions. The first question we address is: what are the incentives for corporate hedging? Then we examine whether the motives for corporate hedging differ according to the prevailing macroeconomic situation: pre-crisis, during a financial crisis and in the post-crisis period. We measure hedging as a binary indicator that equals 1 if a firms hedges with foreign currency, interest rate and/or commodity derivative instruments, and 0 otherwise.

We add several new insights to the knowledge on rationales for hedging. First, we use novel data of financial derivatives usage and ownership structure of UK non-financial firms over 2005-2011. Second, the chapter contributes to knowledge by investigating the effects of ownership structure on a firm's propensity to hedge. Among other investigations conducted, for example, we categorise institutional investors based on their monitoring costs and ability to influence management decisions. This is because, although extant literature indicates that institutional investors have a preference for low volatility and as such would pressure managers to monitor risk (Hutchinson et al. 2015; Rubin and Smith 2009), the empirical evidence of the effects of institutional share-ownership on a firm's propensity to hedge is still very limited, and the investor type that influences hedging decisions is unknown. In addition, we contribute to knowledge by examining empirically and showing, whether there is difference in the motives for firm-level derivatives usage across three different macroeconomic conditions; to the best of our knowledge, this is the first study on corporate hedging to adopt this approach.

The empirical study offers several important findings. First, derivatives users are larger, more levered, with more tax liability and intangible assets than non-users, which is consistent with the expected costs of financial distress. Also, derivatives users have more spending on capital

assets and tangible capital, and have greater intangible assets than non-users, which is in line with the underinvestment costs explanation. Further, derivatives users have a higher percentage of institutional owners and lower insiders' owners than non-users. Second, the expected costs of financial distress, exposure to foreign exchange risk, and size significantly influence firms' decisions to hedge, irrespective of the prevailing macroeconomic conditions. However, the marginal effects of the factors differ in the different situations. Third, we find that tax liability has a significant positive effect on a firm's propensity to hedge during the financial crisis period only. In addition, we show that institutional investors, particularly investors that have fewer business ties with firms, have incentive to influence firms' decisions to reduce volatilities through hedging.

Our findings have significant implications for corporations and for future research on rationales for corporate hedging. First, to the extent that firms engage in hedging activities to reduce cash-flow volatilities, corporate managers may need to consider that firm-level factors that would achieve this objective are subject to the prevailing economic conditions. Also, our analysis indicates to shareholders the importance of institutional investors, particularly independent investors, in influencing managers to maximise firm value. Second, since we are unable to use a continuous hedging variable, future research may shed more light on the extent of derivatives usage, in value terms, under the three macroeconomic conditions.

CHAPTER 3: CORPORATE HEDGING, OWNERSHIP STRUCTURE AND FIRM PERFORMANCE

3.1: Introduction

There is a growing concern among the management of UK non-financial firms about the expected performance of their firms. In 2014 alone, about 299 large firms of the FTSE-350 warned that they were likely to report worse performance. By comparison, only 255 of such firms issued similar performance warnings in 2013 (Smith 2015; Watkins 2015). This represents about 15 per cent increase. This revelation raises very pertinent questions. Among the most relevant and direct ones are: First, do UK firms manage their exposure with financial derivatives? If they do, then, what is the impact of derivative use on their performance? Providing answers to these questions would shed more light on the factors that impact performance among UK firms. Also, the answers would show how corporate financial policy such as derivative usage impacts performance.

Existing theories suggest that firms would be able to increase their performance if they hedge with derivatives under the assumptions of an imperfect capital market - that is, the presence of financial distress cost, asymmetric information, taxes and agency costs that are associated with under-investment and risk-shifting problems (Smith and Stulz 1985; Breeden and Viswanathan 1990; Bessembinder 1991; DeMarzo and Duffie 1991; Froot et al. 1993). Froot et al. (1993) argue that hedging can maximise performance through its ability to reduce unnecessary volatilities in cash-flows that would affect the amount of funds firms can raise externally as well as investment expenditure. For example, if a firm experiences cash-flow volatility without having hedging policy in place, it may encounter increased marginal costs of funds, which may result in increased external financing. Also, the firm may be compelled to reduce its investments. Thus, hedging with derivatives will ensure that firms have sufficient internally generated funds to undertake valuable investment opportunities, thereby increasing the performance of such firms.

Most previous empirical literature on the implications of derivatives usage examined the unconditional effects of using derivative instruments on firm value (Allayannis and Weston 2001; Carter et al 2006a; Jin and Jorion 2006 to mention a few). For example, Carter et al. (2006a), examine the impact of jet fuel hedging on US airline value. They report that hedging

of jet fuel has positive impact on value with about 5% to 10% hedging premium. The fundamental issue with unconditional studies is that their results may be noisy and difficult to interpret as they do not consider that the efficiency of corporate policies including derivatives usage may depend on organisational factors and the external environment in which firms operate (Allayannis et al. 2012; Hutchinson and Gul 2004; Wu 2008). There are very few empirical studies that examine the conditional implications of derivative usage and those existing papers are predominately US-focused. The two main works that are directly related to such studies are those of Fauver and Naranjo (2010) and Allayannis et al. (2012).

The investigation of the effects of the organisational environment such as the effects of ownership structure on the relation between derivative usage and performance may be crucial to what we already know in several ways. First, considering executive compensation policies, it is possible that firms that have weak and ineffective mechanisms to monitor and discipline managers may use derivatives to address managerial risk preferences. This is because when the wealth of risk averse managers is tied to firm performance, managers may choose to either invest in positive NPV projects that are less risky or they may use derivatives to lower their firms' risk (Almazan and Suarez 2003; Lel 2012). On the other hand, under the alignment assumption, since derivative usage can add to firm value through its ability to reduce cash-flow volatility (Froot et al. 1993), managers that have their wealth tied to firm performance have an incentive to invest in valuable projects. This is because the use of derivatives would make internally generated funds available to the managers to maximise their wealth as they do with their firms. Thus, managerial share-ownership would make them use derivatives to maximise firm performance. Lastly, under asymmetric information, ownership structure as a corporate governance mechanism may be used by the markets as a focal point to draw inferences about a firm's motives for using derivatives and as such it may place more value on the performance of firms that have good governance (Allayannis et al. 2012). This is because firms that have strong corporate governance mechanisms in place may adopt hedging strategies using derivatives to reduce financial market imperfection, while firms that have weak corporate governance mechanisms may adopt the same strategy to pursue manager's interests (Lel 2012). Thus, we conjecture that to the extent that market frictions can be reduced by derivatives usage, firms that have strong monitoring of managerial activities (institutional ownership) would have high performance than non-derivative users.

We explore the factors that impact the performance of UK firms by first examining whether hedging with financial derivative instruments has an impact on firm performance and then, how organisation environment such as firm ownership structure interacts with the relation between derivative usage and firm performance. We consider that a firm that has agency problems could employ insider and institutional ownerships as corporate governance mechanisms to reduce agency problems. The extent to which ownership structure could mitigate the agency problem could move the firm gradually away from having the benefits of engaging in hedging activities. This is because, according to the alignment theory of ownership structure, insiders' shareholdings could align the interests of management with those of investors, to the extent that managers would engage in policies that enhance the performance of their firm. As a result of the reduced incentive, the benefits that the firm gets from hedging activities would be reduced. If such a firm should hedge with derivatives, then its performance would not be as it would have been if it had agency issues. Hence, we argue that ownership structure (as a measure of governance) that is able to reduce agency problem, is capable of reducing the effect of derivative usage on firm performance. The main hypotheses we test therefore are, *ceteris paribus*, (1) derivative usage has a positive association with firm performance, (2) the positive relation between derivative usage and performance is weakened by board of directors' ownerships and (3), the positive relation between derivative usage and firm performance is weakened by institutional ownerships.

To perform our analysis, we employ UK non-financial firms that are listed on the London Stock Exchange for a sample period 2005-2011. To begin our analysis, we construct our main variables. First, we adopt a forward looking performance measure that is market based and proxied by Tobin's Q. We focus on the market-based performance for two main reasons. One, while we recognise that firms use different measures of performance, Tobin's Q is a good performance indicator as it reveals the market power of a firm from both its existing assets and anticipated future growth opportunities as well as the anticipated change in the quality of projects that is due to change in control (Bharadwaj et al. 1999; Lang et al. 1989). Two, since we attempt to incorporate ownership structure into our study, we dwell on past studies that suggest that a firm's Tobin's Q may be influenced immensely, among other factors, by the performance of the existing managements that are in the firm (Lang et al. 1989). Second, we represent derivatives usage with a ''binary indicator'' that takes a value of one when a firm uses at least one of the following financial derivative instruments: (a) foreign currency (b)

interest rate and (c) commodity derivatives for hedging purposes and zero if otherwise. Finally, we rigorously source and carefully collect by hand, ownership data from the Thomson One Banker Online from 2000-2013. We measure the board of directors' ownership as the number of shares held by the board of directors of a firm divided by the firm's total number of outstanding shares in a fiscal year; and the total institutional ownership as the number of shares held by all institutional investors divided by the firm's total number of outstanding shares in a fiscal year.

This chapter contributes to the existing literature in several important ways. First, the chapter explores three main important questions that are of utmost importance in the corporate derivative usage and firm performance literatures: (a) Does the use of derivatives culminate in higher firm performance? (b) If so, how does ownership structure affect the relation between derivative usage and firm performance? (c) Which type of managerial (institutional) shareholders really affects the relation between hedging and firm performance? Second, we contribute to the existing studies by employing carefully and uniquely hand-collected ownership structure and derivative usage data of UK non-financial firms. Third, the chapter benefits from the unique opportunity to employ sample periods that provide natural experience of a financial crisis period. Fourth, the chapter focuses on firm performance by looking at performance through its interaction with the ownership structure that exists in firms and use of derivatives. The way in which we conduct the study enables us to highlight the implications of derivatives usage on firm performance as well as address how ownership structure may interact with the relation between the two. These help provide further insights into risk management policies for firms and investors. Lastly, the chapter contributes to the existing literature in respect to our model specifications. We effectively control for the endogeneity problem that may arise in our examination of the unconditional impacts of derivative usage on firm performance by (1) introducing firm ownership structure variables into our estimations to serve as exogenous variables (2) estimating a partial dynamic performance equation. We estimate that firm performance at time *t* is a function of the explanatory variables at time *t-1*. While past empirical literature has investigated potential environmental factors that could impact the relationship between use of derivatives and firm value, to the best of our knowledge there is yet to be an empirical study that examines the unconditional valuation impacts of derivatives usage relative to the moderation of prior year (existing) corporate governance.

Our empirical analyses reveal several important findings. First, we find that use of financial derivatives by UK non-financial firms helps stabilise cash-flow, as hedging firms have stable cash-flow while non-hedging firms have volatile cash-flow. Second, the use of derivatives has a negative impact on performance, although the estimated coefficients are not significant. When we consider the prevailing macroeconomic situation, the use of derivatives might have a good economic impact on firm performance during a financial crisis. Third, contrary to the arguments presented in previous literature (for example, Goergen and Renneboog 2001) that institutional investors in the UK play a passive role in the firms that they invest in, we find evidence that institutional investors in the UK, particularly independent investors, monitor and exert influence on corporate decisions. This might be their way of safeguarding their huge investments in firms. The positive association of institutional ownership and performance has great economic benefits during normal macroeconomic environment condition. Fourth, we find on average that institutional investors have more economic impact on non-derivatives users' performance than they do on that of derivatives users. Taking together this finding with the first one that non-hedging firms have volatile cash-flows than hedging firms, our results suggest that institutional owners in non-hedging firms assume more active role of monitoring and influencing the activities of non-hedging firms to ensure good performance than they do in hedging firms. Alternatively, institutional investors may be attracted to the better performance in non-hedging and as such hold large shares in the firms. Fifth, we find evidence that the percentage of shares held by firm insiders (executive directors, non-executives and CEO_CFO) has positive effects on performance.

Furthermore, in the study that examines the joint effects of corporate hedging and ownership structure on performance, we categorise the sample into four sub-samples based on the median of board of directors' ownership and institutional investors' ownership. We find that the effect of hedging on the performance of firms with high board of directors' (institutional) ownerships is different from those with low board of directors' (institutional) ownership. Specifically, we find that the effect of hedging on the performance of firms with high board (institutional) ownership is weaker than in firms with lower board (institutional) ownerships. We interpret this to mean that there is no performance benefit associated with the use of derivatives when ownership structure is high. The findings support our argument that derivatives usage plays no important role in firms that have institutional and insiders' ownerships. Lastly, although hedging does not have positive effects on our sample's performance, we observe that

institutional investors that have fewer business relations with a firm (i.e., grey investors) actively monitor and influence firms' management to make decisions that induce good performance, as we find a positive association between the holdings of grey investors and firm performance.

The remainder of the chapter is organised as follows. Section 2 discusses the related literature and develops testable hypotheses. Section 3 describes the data and discusses the different methods used in the regressions. Section 4 presents our results. Section 5 reports further checks and Section 6 concludes.

3.2: Literature Review and Development of Testable Hypotheses

3.2.1: Literature review

In this subsection, we review some past studies that examined the relation between use of derivatives and firm performance.

Under the perfect capital market assumption, it is irrelevant for a firm to use derivatives as a hedging strategy as there may be no benefit for it (Modigliani and Miller 1958). This is because there are no information asymmetries, taxes and transaction (including financial distress) costs in the first place. In the presence of market frictions however, firms that may find it difficult to obtain external financing, that have a probability of encountering financial distress, information asymmetry and agency problems may find it beneficial to use derivatives as they are likely to maximise their performance (Bessembinder 1991; DeMarzo and Duffie 1991; Froot et al 1993; Stulz, 1984; Smith and Stulz 1985). In the presence of agency problems, which are associated with underinvestment, Froot et al. (1993) argue that firms would benefit from using derivatives since such a policy would ensure that firms do not forgo valuable investment opportunities, as sufficient internally generated funds would be available.

Subsequently, several empirical investigations have been carried out to ascertain the effects of derivative usage on firm performance (for example, Allayannis and Weston 2001; Andersen 2008; Bartram et al. 2011; Bessembinder 1991; Carter et al 2006a and b; Jin and Jorion 2006; Mackay and Moeller 2007; Nelson et al 2005; Treanor et al 2014). Common to some of the above-mentioned empirical studies is that they examined the unconditional effects of derivative usage. Also, the findings of the earlier studies have been mixed. For example, Carter

et al. (2006b) examined the relation between jet fuel hedging and airline firm value using a dataset of 28 U.S airlines for the period of 1992-2003. They reported that an airline that hedged 100% of its fuel requirements had about 10% value premium relative to one that did not hedge its fuel requirements. A few other studies that document positive association between the use derivative and firm value include: Nelson et al. (2005); Carter et al. (2006b); Andersen (2008); Bartram et al. (2011); and Treanor et al (2014). On the other hand, some other papers suggest that there is no relation between derivative usage and firm performance. For example Jin and Jorion (2006) argue that positive valuation effects of derivative usage might be a spurious correlation of the revelation that a firm has agency problems.

Nevertheless, some extant studies argue that the results provided about the unconditional effects of derivatives usage could be noisy and difficult to interpret as they do not consider the impacts of organisational and external environmental factors on the efficiency of the financial policies that firms make (Allayannis et al. 2012; Hutchinson and Gul 2004; Wu 2008). Then, Fauver and Naranjo (2010) test and provide evidence on the effects of derivatives usage on firm value through the interaction of potential agency and monitoring problems using a sample of U.S firms from 1991 to 2000. Using firm characteristics such as corporate governance, agency costs, aggregate monitoring index, information asymmetry variables[12] and interactions of the variables with derivative usage in their regressions, they report that firms that have greater agency and monitoring problems tend to have negative Tobin's Q and derivative usage relation. Specifically Fauver and Naranjo (2010) observe that firms that have weaker corporate governance, firms that are less transparent, face greater agency costs, have larger information asymmetry problems and have overall poorer monitoring tend to have a negative relation between Tobin's Q and derivative usage. They conclude that firms that have higher probability of facing agency costs and monitoring problems use derivatives to potentially channel the costs of agency and monitoring problems, thereby causing the valuation of the firm to be reduced.

While past empirical literature has investigated potential environmental factors that could impact the relationship between use of derivative and firm value, to the best of our knowledge

[12] Fauver and Naranjo (2010) use two measures of corporate governance (1) the entrenchment index as used by Bebchuk et al. (2009) and (2) the corporate governance index developed by Gompers et al. (2003). Agency cost is measured by ratios of sales to assets and free cash-flow to assets. They measure information asymmetry and asset opaqueness by the adverse selection component of the bid-ask spread, the ratio of intangible assets to total assets and the annual time-series Probability of Informed Trading (PIN) that was used by Easley and O'Hara's (1992). To compute an aggregate monitoring index, they follow Schmidt (2008).

there is yet to be an empirical study on the unconditional valuation impacts of derivative usage relative to the moderation of prior year (existing) corporate governance. Therefore, in this study, we address the gap and examine the joint impacts of ownership structure (insider and institutional ownership) and derivative usage on firm performance. In order to conduct the empirical investigations of this chapter, we develop in the next subsection five main important testable hypotheses.

3.2.2: Development of testable hypotheses

In this subsection we develop testable hypotheses that are supported by existing theories and past empirical studies.

3.2.2.1: Derivatives usage and performance

In imperfect capital markets, a firm's performance is influenced not only by its size and the availability of valuable growth opportunities, but also by its ability to use financial derivatives to mitigate financial distress cost, asymmetric information, under-investment and risk-shifting problems. Froot et al. (1993) argue that derivatives usage may increase the performance of a firm through its ability to mitigate underinvestment problems. This is because a firm that uses derivatives may not have to forgo valuable investment opportunities, in that hedging policy provides sufficient internal funds to a firm that finds it difficult and/or costly to obtain external funds. Allayannis and Weston (2001) confirm that derivatives users have higher market valuation because the market believes that hedging would not make the firms pass up valuable projects.

We test the association between hedging and performance by including a performance variable in our estimations. Previous research shows that *Tobin's Q* embodies a firm's market power as it can be influenced by firm's existing assets, its anticipated future growth opportunities as well as its anticipated change in the quality of projects (Bharadwaj et al. 1999; Lang et al. 1989). Also, the decisions that are made by as well as the performance of a firm's existing management can be revealed by the firm's Tobin's Q (Lang et al. 1989). We compute *Tobin's Q* as the total assets minus the book value of equity plus the market value of equity divided by the book value of assets. Several past studies also adopted the measure. For example, studies on ownership structure (Lemmon and Lins 2003; Florackis et al. 2009), corporate cash-holdings (Ozkan and Ozkan 2004); and risk management (Allayannis et al.

2012; Arslan-Ayaydin et al. 2012; Belghitar et al. 2013; Fauver and Naranjo 2010) adopted the measure of Tobin's Q.

Hypothesis 3.1: There is a positive association between *hedging* and *firm performance*.

Furthermore, we include several variables that may correlate with firm performance. Smith and Stulz (1985) argue that the use of derivatives maximises firm value as it reduces the costs of financial distress. This cost of financial distress arises because, since the potential debtholders do not have market power, they presume that the proceeds of a debt issue may be paid out to shareholders as dividends; hence, they may impose bond covenants that may constrain the investment policy of the firm. Hence, hedging with derivatives provides a means for a firm that anticipates valuable future growth opportunities to reduce the investment constraints imposed by bond covenants as well as convince debtholders that its investment policies are higher than the expected costs of financial distress. In the same vein, in the presence of asymmetric information, firms that hedge with derivatives may find it not too difficult to obtain external financing to undertake profitable projects when they face financing constraints.

It is argued that investment opportunity set is an important factor that may affect the market value of a firm. This is because investment opportunities may reveal all positive net-present-value projects that are available to the firm (Myers 1977; Smith and Watts 1992; Jones 2001). Firms that have more valuable growth opportunities may maximise performance as such firms may find it easier and less costly to obtain external financing (Lyandres and Zhdanov 2013; Jones 2001). Carter et al. (2006a) argue that investors may reward derivative users that invest in capital expenditure with high value as such investment may be viewed as indicative of positive net-present-value (NPV) projects. We measure growth opportunity as the ratio of capital expenditure to total assets, and expect a positive relation between capital expenditure and Tobin's Q. This is because firms that have high capital expenditure may show greater investment opportunities relative to their other existing assets (Adam and Goyal 2008).

3.2.2.2: Corporate ownership structure

3.2.2.2.1: Insiders' ownership

The separation of ownership and control creates divergence of interest between insiders and shareholders (Berle and Means 1932). Jensen and Meckling (1976) argue that unless insiders hold some percentage of shares in their firm, separation of ownership and control could create ''some divergence between the agent's decisions and those decisions which could maximize the welfare of the principal'' (p482). Smith and Stulz (1985) also argue that unless managers are faced with proper incentives they will not engage in strategies that would maximize shareholders' wealth. The supporters of alignment theory argue that the degree to which insiders control and align their interest with that of the shareholders depends on the percentage of voting rights they own (Shleifer and Vishny 1997; Lemmon and Lins 2003; Ozkan and Ozkan 2004; Florackis and Ozkan 2009; Kim and Lu 2011). Further, Allayannis et al. (2012) argue that managers of firms that have strong corporate governance are more likely to engage in value maximizing strategies such as hedging rather than pursue their own self-interest. Hutchinson and Gul (2004) argue that management share-ownership ensures that managers engage in risk-bearing strategies that increase firm value. Then, Lilienfel-Toal and Ruenzi (2014) argue that insiders' ownership could mitigate the impact of weak governance in firms as insiders would reduce empire-building but run their firms in more efficient ways.

In the presence of managerial risk aversion, Smith and Stulz (1985) submit that if managerial stock holding is a concave function of the performance of their firms, managers may follow financial policies that would reduce the firm's cash-flow volatility. Hence, a linear relation between managers' wealth and firm performance may create incentives for managers to use more derivatives to reduce the volatility of the firm's performance. The main hypotheses under the insider's ownerships are in two parts. First, we test the validity of the alignment hypothesis by examining the relation between *managerial shareholdings* and firm performance. Second, we examine the effects of the interaction of derivative usage and *managerial ownership* on firm performance. We employ two different proxies to measure insiders' ownership. First, we use the Board of directors' share-ownership. The Board of directors' ownership (*BOARD_OWNERSHIP*) is measured as the percentage of shares held by executive (*EXEC_OWNERSHIP*) and non-executive (*NON_EXEC_OWNERSHIP*)

directors. Second, we measure the percentage of shares held by the chief executive and chief finance officers (*CEO_CFO*). Thus, the testable hypotheses are stated as:

Hypothesis 3.2a: There is a positive relation between *managerial ownership* and firm performance.

Hypothesis 3.3b: The interaction of hedging on performance is lower for firms that have *high managerial ownership*.

3.2.2.2.2: Institutional ownership

Institutional investors have the incentive to monitor and exert influence on financial decisions in order to safeguard the dynamics of existing corporate governance, enhance the value of their investment as well as the overall value of the firm (Gillan and Stark 2003; Chen et al. 2007; Brav et al. 2008; Andriosopolous and Yang 2015). In the presence of market frictions, firms with asymmetric information may face high cost of borrowing as investors may find it somewhat difficult to evaluate the quality and the quantity of their investments (Stiglitz and Weiss 1981). Then, Roberts and Yuan (2010) argue that the costs of borrowing may be lowered in firms with asymmetric information because of the presence of institutional investors. This is because the lenders may believe that the activities of the firms' managers are actively monitored by the institutional shareholders. Hence, the firm may be able to obtain sufficient funds to reasonable price to finance valuable projects. Using bank borrowing as a proxy for firm specific risk, the authors report that a one standard deviation increase in institutional ownership leads to a 23 point basis reduction in loan spread.

The main investigations relating to institutional ownership category are in two parts. First, we test the validity of the monitoring hypothesis by examining the relation between *total institutional ownership* and firm performance. Second, we examine whether the presence of *institutional investors* improves the association between derivative usage and firm performance. We measure institutional ownership using several proxies. First we measure the percentage of shares held by all institutional investors (*INS_TOTSHARES*). Second, we categorise institutional investors into independent and grey institutional investors based on their monitoring incentives due to their business dealings with firms. Past papers such as Almazan et al's (2005); Cornett et al's (2007) and Ferreira and Matos's (2008) use similar methods. They argue that since independent institutional investors do not have business

dealings with their firms, the investors would monitor and oppose management decisions and policies that would erode value. We measure the independent institutional investors (*INS_INDEP*) as the percentage of shares by investment advisors, mutual funds and hedge funds, and expect a positive relation between the variable and firm value. On the other hand, ownership by grey institutional investors (*INS_GREY*) is measured as banks and trusts, insurance companies and other institutions such as pension funds, foundations and endowments, and we expect a negative relation with *INS_GREY* and performance. The main hypotheses we test are:

Hypothesis 3.4a: There is a positive association between *institutional ownership* and firm performance.

Hypothesis 3.4b: The interaction of hedging on performance is weakened with high share-*ownership of institutional investors.*

3.2.2.3: Financial constraints

Firms that have better access to capital markets may have higher valuation than firms that experience difficulties in accessing the market (Didier and Schmukler 2013). Froot et al. (1993) advise that firms that face increased marginal costs of external financing should always hedge their cash-flows. Some studies suggest that derivative users may have higher value than non-users as users may have easy access to external funds that would allow them to meet financing needs that arise from unanticipated cash-flow shortfalls (Allayannis and Weston 2001; Jin and Jorion 2006; Arslan-Ayaydin et al. 2012). Allayannis and Weston (2001) argue that dividend paying firms may not experience financial constraint and may have lower value. Following prior studies (such as Carter et al 2006a&b; Fauver and Naranjo 2008; Panaretou 2010; Allayannis et al. 2012), we proxy for firm constraints by using a dividend dummy. We expect a negative relation between dividend and Tobin's Q. Further, Andersen (2008) argues that the current size of a firm is a reflection of past performance. He expounds that the size of a firm could reflect whether the firm would be financially constrained or not. Hedging theory on the other hand suggests that economies of scale exist in the use of derivatives to the extent that large firms may have greater incentives to hedge with derivatives. Past studies find that large firms are more likely to use derivatives than smaller firms, as that would provide them with internal financing to fund positive NPV projects. We compute firm size by first converting the

nominal values of the book value of total assets to year-1999 pound values using the retail price index[13]. This enables us to take account of inflation that may bias our results. Then, we convert the values to natural logarithm.

Furthermore, the trade-off theory suggests that a firm that uses debt may show high firm performance as a high leverage level enabling a firm to increase its tax-shield, which in turn would increase the firm's performance (Graham 2002). In the presence of agency problems, managers could utilise the free cash-flows at their disposal to pursue their personal interests by consuming perks and investing in negative NPV projects rather than invest in projects that maximise firms' wealth (Jensen and Meckling 1976). Under the free cash-flow theory, Jensen (1986) argues that firms with valuable growth opportunity sets may issue more debt to reduce wastage as debt issuance compels managers to be more efficient and to make debt repayment, thereby mitigating agency problems of underinvestment. Myers and Majluf (1984) argue that in the presence of asymmetric information, firms that have fewer internal funds and that have valuable future investment opportunities may use more debt when the cost of informational dilution is too high to issue equity. This is because in the presence of information asymmetry, potential equity-holders may believe that firms may act in the interest of their existing shareholders, and thus may increase the costs of capital. Chen and King (2014) show that when the costs of debt is low, firms may use more derivatives. Graham and Rogers (2002) document that use of derivative increases firm value by 1.1% thereby allowing firms to increase their debt capacity. Treanor et al. (2014) examine the implications of hedging in the US airline industry and find a significant economic premium of 5.2%. In summary, these arguments suggest that there is a positive association between leverage and firm performance. Hence, we measure leverage as the ratio of total debt to total assets.

The main hypotheses that we test under the financial constraints argument are that:

Hypothesis 3.5a: There is a positive association between *leverage* and firm performance.

Hypothesis 3.5b: There is a positive association between *size* and firm performance.

Furthermore, we investigate other variables that may affect the relation between financial constraints and firm performance. For instance, it is argued that in the presence of costly external financing, multinational firms (MNCs) may not only be able to access broader capital

[13] The retail price index was obtained from the Office for National Statistics website.

markets but also, they would be able to improve the efficiency of the internal financial markets by substituting the internal capital markets for the costly external ones to increase the allocation of funds to valuable projects in more favourable geographical regions (Hovakimian 2011; Volkov and Smith 2015; Yan et al. 2010). In the presence of agency problems, the controlling shareholders of firms that have valuable growth opportunities may concentrate their efforts on increasing the performance of their firms by committing to reduce their expropriation activities to ensure the firm can obtain sufficient funds at the external market at the lowest costs (Doidge et al. 2004). We control for geographical diversification by using a binary indicator that takes the value 1 if a firm diversifies into other geographical region and 0 if otherwise. We expect a positive association between geographical diversification and firm performance.

In addition, Hoskisson et al. (1993) argue that industrial diversification may expand the level of control that is under a firm's management beyond limit. For example, managers of highly diversified firms may lose understanding of their firms' multiple operations, to the extent that they make unfavourable decisions for profitable divisions, thereby reducing the overall performance of their firms. Also, Jiraporn et al. (2006) argue that managers may attempt to exploit firms that have weak shareholders' rights by diversifying into different types of industry, thereby wasting firms' resources. Rajan et al. (2000) argue that if a firm diversifies into divisions that depend on similar resources and opportunities, it would be possible for the firm to transfer funds from an unprofitable division to a more profitable one, thereby improving the efficiency of its investment as well as enhancing its performance. We control for industrial diversification by using a diversification indicator that equals 1 if the firm operates in more than one segment and 0 if otherwise.

3.3: Research Design

This section presents sources of data and definitions of variables used in the regressions carried out in this chapter. Also, we present statistics and correlation coefficients of variables as well as explain the econometric methods used in regressions.

3.3.1: Sample construction

We source and collect by hand detailed data about the ownership structure of randomly selected sample of UK listed firms from Thomson One Banker website for the period covering

2000 and 2013. We first collect for individual firms, detailed information on the board of directors' ownership in each fiscal year. The board of director ownerships represents the ownerships of executives and non-executive directors. Second, we collect by hand the list of all the shareholders that are in each firm as well as their shareholdings. Then, we match the names of the board of directors with the list of the firm's shareholders and collect their shareholdings for the periods. In order to examine the impact of chief executive and chief finance directors on performance, we carefully look at ownership by executive directors and separate ownership by chief executive and chief finance directors from ownership by other executive directors.

Also, we collect information about the ownership of institutional investors, which includes the ownerships of independent institutional investors and those of grey institutional investors. To collect the institutional ownership data, we exclude strategic investors and their shareholdings from the list of all shareholders[14]. In total, we have about 3,991 firm-year observations. The data on ownership structure is matched with derivative usage data, also collected by hand from company annual reports for the period of 2005-2011. As a result of the matching of ownership data with that of derivatives usage, we lose some firm-year observations as the sample period used in the regressions was 2005-2011.

Further we control for and measure several variables, which data were collected from *Datastream* and *Thomson Financial* databases. We follow past literature and impose some standard data restrictions on our data. First, we exclude financial institutions and utility firms. This is because these firms are subject to different regulations, may report performance in different ways, may employ derivative instruments for reasons other than hedging and may be actors in the derivatives market. Second, we eliminate firm-year observations that have missing data for our variables of interest. Lastly, we trim data at both ends of the percentiles[15] to eliminate possible outliers. Following screening of the screening of the data, we have an unbalanced panel of 207 firms with 1,281 firm-year observations.

[14] The investor types are based on Thomson One Banker investors' classification.
[15] The data was trimmed after we observed the distributions of data for possible outliers using Histogram graphs.

3.3.2: Methodology

This subsection explains all the methods used in carrying out our investigations as well as discusses the econometric issues faced in the investigation and how we address the issues.

By estimating a model of the current year firm performance on current year derivatives usage, our empirical model may face a crucial econometric issue – that is the endogeneity[16] issue, which may ‘‘lead to biased and inconsistent parameter estimates’’ that may result in unreliable inferences (Roberts and Whited 2012: p6). Endogeneity problems may arise in our performance equation if hedging and performance are simultaneously determined by firms to the extent that changes in hedging decision may lead to changes in firm performance; and changes in firm performance may prompt changes in hedging decision, i.e., *reverse causation*. For instance derivatives usage may on the one hand influence firm performance through its ability to stabilise volatility and facilitate easy access to external finances to undertake investments. On the other hand, firm performance may motivate a firm to hedge with derivatives. Suppose we model performance in the presence of reverse causation, if there is an increase in the error term it may lead to direct increase in firm performance. This increase in firm performance may subsequently affect the hedging decision through reverse causation; thus, the error term would be correlated with corporate hedging. The correlation between the error term and corporate hedging may bias our estimates because it is likely that some of the reverse influence of firm performance on hedging may get into our estimated coefficient.

We address the endogeneity problem faced by our study in two different ways. Firstly, our model assumes that firm performance at time *t* is a function of lagged explanatory variables e.g., hedging policy at time *t-1* (Cornett et al. 2007; Lee and Lee 2009). Cornett et al. (2007) argue that the effects of prior year change in firm ownership structure may not be observable in the performance of that same year, but may be observable in the performance of the following year. Further, they argue that lagging the explanatory variables by one year could mitigate the potential endogeneity problem that could arise due to the simultaneity effect. Based on these understandings, we estimate performance at time *t* against explanatory variables that are lagged by one year. Cornett et al. (2007) employed a similar method to

[16] The endogeneity problem is the violation of the classical linear regression model assumption that *x* variate and μ (error term) are uncorrelated i.e., $cov(\mu_i, x_i) = 0$. The endogeneity problem may arise from measurement error, omitted explanatory variable, unobserved heterogeneity and simultaneity bias.

address endogeneity problems faced in their study on the relationship between institutional shareholders' involvement and the operating performance of S&P 100 firms. Chava and Purnanandam (2010) employed the method in their examination of the effect of managerial risk-taking incentives on firm financial policies. Also, Arslan-Ayaydin (2014) employed the method in their study of the impact of financial flexibility on investment and performance of East Asian firms.

Secondly, we introduce exogenous variables to our models that enable us to examine the joint effect of hedging and ownership structure on firm performance. Jin and Jorion (2006) suggest that the link between derivatives usage and firm performance may lie in the activities of management who may be ''acting for personal utility maximisation purposes'' (p915). Based on the (a) alignment and entrenchment theories regarding insiders; (b) monitoring and entrenchment theories relating to outsiders, we introduce several measures of ownership structure to serve as exogenous variables. We separate the BOARD_OWNERS and INS_TOTSHARE variables into two subgroups each, thus, the high BOARD_OWNERS (INS_TOTSHARE) and low BOARD_OWNERS (INS_TOTSHARE). Then estimate hedging-performance model on each group.

The baseline performance model therefore is:

$$Tobin's\ Q_{it} = \alpha_0 + \beta_1 Deriv\_usage_{i,\,t-1} + \beta_3 Size_{i,\,t-1} + \beta_4 Lev_{i,\,t-1} + \beta_5 CAPEX_{i,\,t-1} + \beta_6 Div_{i,\,t-1} + \beta_7 Ind\_Divers_{i,\,t-1} + \beta_7 GeoDummy_{i,\,t-1} + \varepsilon_{i,t} \quad \text{(Equation 3.1)}$$

where α is the constant term, β_1-----$_7$ are the parameters that are estimated by our model; *t* and *i* denote ''time'' and ''firm'' respectively. DERIV_USE is the hedging dummy variable which takes the value of 1 if a firm uses foreign currency, interest rate and/or commodity derivatives to hedge exposures and 0, if otherwise. The variables Size, Lev, CAPX and Div are vectors that control for firm size, leverage, investment growth and firm's ability to access financial markets respectively. The regression error term is represented by the ε.

To compute the variables used in our analysis, we use the average of two-year information to compute each variables. According to previous papers, models that utilise average explanatory variables data afford us the opportunities to (1) mitigate the problems that would have arisen due to short-term fluctuations and extreme values in a particular year, while (2) the use of past values in this way, enables us reduce the possibility of observed relations that might have

shown as impacts of performance on firm-specific characteristics (Florackis 2006; Ozkan and Ozkan 2004; Rajan and Zingales 1995). Thus, to compute our 2006 regressors, we use the average data of 2005 and 2006. We explore the validity of the results of our investigation by estimating several econometric models. We start by estimating the cross-sectional performance models in two different ways. The first average cross-sectional estimation of the study is the annual average cross-sectional regression using the ordinary least square (OLS) estimator with the Stata module *regress*. We estimate the baseline model by regressing the firm performance variable in the year under observation on the previous year explanatory variables. For instance to analyse the performance-hedging relation in 2006, we regress the 2006 firm performance on the 2005 explanatory variable. We do this for each year. This analysis allows us to explore and observe how the use of derivatives has impacted performance in each year.

Further, we pool the average cross-sectional regression in the second average cross-sectional estimation. We combine all the data in the annual average cross-sectional regression, i.e., the average cross-sectional and time-series data and invoke the OLS estimator command using the Stata module *regress*. Thus, we have the pooled average cross-sectional regression. It is suggested in the literature that the average cross-sectional regression can mitigate endogeneity issues, and thus, has also been used in some previous studies for such a purpose. For example, Rajan and Zingales (1995) proposed the model and employed it in a capital structure study; Ozkan and Ozkan (2004) adopted the model to examine determinants of cash-holdings and Florackis (2006) employed the model to investigate the relation between agency costs and corporate governance.

To verify that the results we obtained by the earlier explained methods are not affected by the ways in which we compute our variables, we employ other methods to deal with the endogeneity problems. We estimate a separate pooled OLS: the standard pooled OLS (POLS) regressions. The standard pooled OLS is different from the earlier estimated POLS in two main ways. First, as opposed to using the average of 2 year values in the computation of our variables, we use the actual values. Second, we estimate the standard pooled OLS by making two very important assumptions. In line with previous studies such as Cornett et al. (2007) which argued that the effect of corporate decisions on performance may not be observable until the following year, we assume first that firm performance is observed in the current year under review i.e., at time 1 (y_{it}). Then, we assume that corporate hedging and ownership

decisions are made at time 0. In so doing, we pool the cross-sectional and time-series data, by regressing firm performance that is proxied by Tobin's Q at 2011 on all explanatory variables that are lagged by one year, and invoke the Stata command *regress*.

One of the shortcomings of our OLS estimations is that the OLS estimator may be overly restrictive as it treats explanatory variables as though they are fixed (Wooldridge 2002). Also, it is argued that the pooled OLS does not identify the variables of each firm over time, as it assumes that the average values of the variables as well as the associations between the variables are constant over time and across all cross-sectional firms (Brooks 2011; Wooldridge 2002). Hence, it is advised that for studies to understand the phenomena of financial information, it is important to capture of the dynamics of each firm's reaction by estimating models that can capture the aggregate time-effects that may have similar effect on the explained variable y_{it} for all firms (Kennedy 2008; Wooldridge 2002). Thus, in our last method we estimate panel models to further investigate the impact of derivative usage on firm performance and at the same time deal with the endogeneity problem that ensues using the random-effect estimator. We use the same assumptions as in the standard pooled OLS, that is, firm performance is observed at time 1, and the ownership structure and decision to hedge with derivatives are observed at time 0. Thus, we regress the firm performance proxy, that is, Tobin's Q at 2011 on all explanatory variables lagged by one year, and invoke the Stata command x*tregar*. In the robustness check that follows, we divide our sample into two subsamples based on whether the firm hedges with derivatives or not. These groupings allow us to distinctly and carefully observe the distinctions between the performance of users and non-users.

Then, we proceed to the next analysis to investigate whether the interaction of derivative usage and ownership structure has an impact on firm performance. To conduct the study, we generate four sub-samples using sample mean for board of directors' and institutional shareholdings. The sub-samples are firms that have (a) high board shareholdings; (b) low board shareholdings; (c) high institutional shareholdings; and (d) low institutional shareholdings. Specifically, firms that have board (institutional) shareholdings greater than the sample mean for board of directors (institutional) shareholdings are classified as having high board (institutional) shareholdings; and firms that have board (institutional) shareholdings lower than the sample mean for board of directors (institutional) shareholdings are classified as having low board

(institutional) shareholdings. Then, we estimate our baseline model for each sub-sample using pooled OLS regressions.

We test the efficiency of our base model by performing the White's (1980) general test for heteroscedasticity[17]. This is because there is a possibility that the variances of the error terms are correlated with some explanatory variables, e.g., firm size. We test the null hypothesis that the variance of the error term is constant across firms (that is $V(\varepsilon_i) = \sigma^2$ for all $_i$) and find a chi-square statistic that is equal to 258.73. At the 1% significance level, we reject the null hypothesis. Hence, we correct for heteroscedasticity in the standard errors that are reported in the average cross-sectional regressions for each year by using the Huber-White-Sandwich estimator of standard errors by invoking the Stata command *robust*.

Further, we consider the serial correlation of the error terms across our sample periods. In pooled OLS estimations, residuals may not be completely independent across periods, that is, errors may be correlated with one, even if time-effects are controlled, thereby producing standard error estimates that could be wrong, which may result in wrong inferences (Petersen 2004; Gow et al. 2010; Cameron et al. 2011). We conduct the Breusch-Godfrey Lagrange multiplier test to examine a joint test for autocorrelation by investigating the relationship between error term and several of its lagged values. We test the null hypothesis that there is no relationship between the current error and any of its previous values. We find a chi-square statistic equal to 301.600. Thus, we reject the null hypothesis at the 1% significance level. To deal with heteroscedasticity and serial correlation, therefore, we (i) cluster our estimations within firms in the pooled OLS and average pooled OLS using the Newey and West (1987) variance-covariance estimator and (ii) assume first-order autocorrelation in the random-effect estimation that assumes that error terms are a result of an independent and identically distributed process.

In addition, we conduct the Hausman test (1978) to identify which panel data estimator (that is random-effect or fixed-effect estimator) is most suitable to explain our models. We test the null hypothesis that coefficients estimated by the consistent random-effect estimator and those estimated by the efficient fixed-effect estimator are similar. We find a chi-square of 38.56 and reject the null hypothesis at the 1% significance level. This implies, therefore, that the fixed-

[17] Unlike other statistical tests for heteroscedasticity like the Goldfeld-Quandt (1965) test, the White test makes few assumptions about the possible form of the heteroscedasticity.

effect estimator is most appropriate in our estimation of the performance equation. However, considering that some of our variables of interest (particularly the ownership structure variables) may be relatively stable over certain periods, the fixed-effect estimator may be biased in this case (La Porta et al. 2002; Morck et al. 1988; Ozkan and Ozkan 2004). Hence, we estimate the performance equation using the random-effect model, as the RE works by using the orthogonality assumption that sample is drawn from a random population with stochastic explanatory variables. Thus, it automatically assumes that the intercept is uncorrelated with the explanatory variables and the overall disturbance term (Baum 2006; Wooldridge 2002).

3.4: Results

This section reports the descriptive statistics of all the variables that are used in our regressions as well as the results of univariate and multivariate tests.

3.4.1: Descriptive statistics

Table 3.1 presents descriptive statistics for the variables that were used in our analyses. On average, the firms' capital expenditure to total assets ratio is 4.3 per cent and average debt usage is 16.1 per cent. As reported in Table 3.1, about 61.2 per cent of our sample used derivatives to hedge and the sample has a mean Tobin's Q value of 2.28. These values seem consistent with those reported by some studies. For example, Allayannis et al. (2012) find a mean Tobin's Q value of 2.21 for their international study. Florackis et al. (2009) find a mean value of Tobin's Q of 2.1 for UK firms.

The average institutional investors' shareholdings for our sample of firms are 44.7 per cent, of which independent institutional investors own a large fraction. Specifically, we find that independent institutional shareholders hold, on average, 40.8 per cent of their firms' total shares while grey institutional shareholders hold only about 3.89 per cent on average. Our results are comparable to some previous studies. For example, Cornett et al. (2007) found for S&P (Standard and Poor) 100 that institutional investors hold on average 59.4 per cent of outstanding shares in firms and grey investors own 34.3 per cent of total shares. Further, we find that the shareholdings of board of directors on average are about 12.3 per cent; of which the holdings of the chief executive and chief finance officers are 5.70 per cent, the holdings

of other executive members of the board are 1.45 per cent and the holdings of non-executive officers are about 5.18 per cent.

In sum, the characteristics of the firms in our sample are in line with prior studies that examine the impact of derivative usage on firm performance. Our sample consists of both large and small firms with average size that ranges from 11.72 to 23.93. This indicates that our findings are not likely to be one-sided. In the next subsection we conduct univariate tests by first comparing the characteristics of high Tobin's Q firms with those of low Tobin's Q firms, then observing the performance of users and non-users over time.

Table 3:1: Descriptive statistics: whole sample, 2005-2011

Descriptive statistics are estimated on the pooled dataset. This table provides the descriptive statistics for the sample used throughout the regressions. It reports the number of observations, mean, standard deviation, minimum, maximum values for the entire sample. The definitions of variables are presented in Appendix 2.3.

VARIABLES	Obs	Mean	Std Dev	Min	Max
Panel A: Performance variable					
Tobin's Q	1,281	2.2824	1.5420	1.0000	15.8046
Panel B: Hedging variable					
Deriv_usage	1,281	0.6120	0.4875	0.0000	1.0000
Panel C: Ownership variables					
Board_owners	1,281	0.1234	0.1808	0.0000	0.9883
Cash-flow volatility	1,281	0.1549	0.2845	0.0032	2.3500
CEO_CFO	1,281	0.0570	0.1190	0.0000	0.7321
Exec_owners	1,281	0.0717	0.1362	0.0000	0.8160
INS_GREY	1,281	0.0389	0.0559	0.0000	0.5516
INS_INDEP	1,281	0.4083	0.2677	0.0000	0.9638
INS_TOTSHARES	1,281	0.4472	0.2838	0.0000	1.0000
Non_exec_owners	1,281	0.0518	0.1198	0.0000	0.9883
Other_exec_owners	1,281	0.0145	0.0524	0.0000	0.5984
Av_Board_owners	1,281	0.1236	0.1796	0.0000	0.9879
Av_CEO_CFO	1,274	0.0586	0.1195	0.0000	0.7345
Av_exec_owners	1,274	0.0727	0.1364	0.0000	0.8186
AV_GREY	1,281	0.0382	0.0531	0.0000	0.5603
AV_INDEP	1,281	0.4053	0.2658	0.0000	0.9533
Av_INS_TOT	1,281	0.4435	0.2813	0.0000	0.9951
Av_non_exec_owners	1,274	0.0516	0.1195	0.0000	0.9879
Av_other_exec_owners	1,281	0.0140	0.0515	0.0000	0.6024
Panel D: Control variables					
CAPX	1,281	0.0432	0.0572	0.0000	0.5316
Div_dummy	1,280	0.6734	0.4691	0.0000	1.0000
GEO_dummy	1,281	0.7980	0.4018	0.0000	1.0000
IND_divers	1,188	0.2079	0.4060	0.0000	1.0000
Leverage	1,281	0.1610	0.1645	0.0000	1.1144
Size	1,281	18.2352	2.1957	11.7228	23.9306
Av_CAPX	1,280	0.0435	0.0518	0.0000	0.4166
Av_Leverage	1,281	0.1624	0.1621	0.0000	0.8089
Av_Size	1,281	18.1924	2.2035	11.8354	23.8913

3.4.2: Univariate analysis

In this subsection, we conduct two main univariate tests to (1) investigate the pattern of the difference that exists between users' and non-users' performance as well as the volatility of their cash-flows (2) examine the difference between the characteristics of firms that have high Tobin's Q firms and those that have low Tobin's Q.

3.4.2.1: Characteristics of firms by Tobin's Q

Table 3.2 reports the descriptive statistics and p-values for the subsamples of firms based on Tobin's Q median value. We find several important differences between the characteristics of the two relatively equal-size groups of Tobin's Q firms: High and low Tobin's Q. We find that only about 54 per cent of our sample that has high Q hedges with derivatives, compared to almost 69 per cent of hedgers among the low Q firms. The difference in the derivatives usage between the subgroups is about 28 per cent, which is considerably large. This finding indicates that the use of derivatives alone might not account for maximization of performance for our sample. We find that high Q firms have slightly higher board of directors' ownership than low Q firms (13 to 11 per cents) with about 1% difference. Also, we observe that high Q firms have a higher percentage of institutional owners (48 per cent), use less leverage (13 per cent) and prefer to diversify into other geographical regions. Further, there is strong evidence that high Q firms prefer not to distribute dividends to shareholders but plough profit back into their capital (65 per cent), which enables them to invest more in capital expenditure (5 per cent) than the low Q firms (3 per cent).

The high Q firms in our sample seem to be on average smaller, prefer to use fewer financial derivatives, are not highly levered, prefer to pay fewer dividends to shareholders and invest more in capital expenditure. Further, the high Q firms tend to have a higher percentage of independent institutional and executive shareholding (particularly the CEO and CFO) and diversify more into other geographical regions. In line with the argument that institutional investors are different in their abilities to monitor and influence management decisions to enhance performance, we find that that high Q firms have a larger percentage of independent institutional investors than low Q firms (44 to 37 per cents). Overall, the univariate tests provide preliminary evidence that there are differences between firms that have high performance and firms that have low performance.

Table 3:2: Characteristics of firms by firm performance

This table shows the characteristics of firms that have high Tobin's Q and those that have low performance (low Tobin's Q). High (low) Tobin's Q represents firms that have high (low) performance and is measured as firms that have Tobin's Q greater (lower) than median. The table shows the number of observations, mean, median, standard deviation, minimum, maximum values for each sub-group. The last column of the table compares the variable mean of the high Q firms with those of low Q firms. Variable definitions are reported in Appendix 2.3. The associated significance levels are obtained from *t-test* with equal variances. ***, ** and * denote that the differences are significant at the 1%, 5% and 10% levels respectively.

Variables	High Tobin's Q					Low Tobin's Q					
	N	Mean	Std dev	Min	Max	N	Mean	Std dev	Min	Max	Difference in mean
Board_owners	674	0.1330	0.1950	0.0000	0.9880	607	0.1130	0.1630	0.0000	0.7540	**0.0200***
CAPX	674	0.0510	0.0660	0.0000	0.5320	607	0.0340	0.0440	0.0000	0.3830	**0.0170*****
Cash-flow volatility	674	0.1912	0.3347	0.0034	2.3500	607	0.1147	0.2084	0.0032	2.3500	**0.0765*****
CEO_CFO	674	0.0630	0.1290	0.0000	0.7320	607	0.0510	0.1070	0.0000	0.6610	**0.0120***
Deriv_usage	674	0.5430	0.4990	0.0000	1.0000	607	0.6890	0.4630	0.0000	1.0000	**-0.1460*****
Div_dummy	674	0.6470	0.4780	0.0000	1.0000	606	0.7030	0.4570	0.0000	1.0000	**-0.0560****
Exec_owners	674	0.0790	0.1460	0.0000	0.8160	607	0.0640	0.1240	0.0000	0.7250	**0.0150****
GEO_dummy	674	0.8120	0.3910	0.0000	1.0000	607	0.7830	0.4130	0.0000	1.0000	0.0290
IND_divers	642	0.2120	0.4090	0.0000	1.0000	546	0.2030	0.4030	0.0000	1.0000	0.0090
INS_GREY	674	0.0400	0.0550	0.0000	0.5520	607	0.0380	0.0570	0.0000	0.5180	0.0020
INS_INDEP	674	0.4410	0.2720	0.0000	0.9640	607	0.3720	0.2590	0.0000	0.9620	**0.0690*****
INS_TOTSHARES	674	0.4810	0.2880	0.0000	1.0000	607	0.4090	0.2740	0.0000	0.9920	**0.0720*****
Leverage	674	0.1290	0.1640	0.0000	1.1140	607	0.1970	0.1570	0.0000	0.7290	**-0.0680*****
Non_exec_owners	674	0.0540	0.1310	0.0000	0.9880	607	0.0500	0.1060	0.0000	0.6130	0.0040
Other_execs	674	0.0160	0.0520	0.0000	0.5980	607	0.0130	0.0530	0.0000	0.5160	0.0040
SIZE	674	17.8700	2.2450	11.7200	23.8700	607	18.6500	2.0650	13.6100	23.930	**-0.7800*****
Av_Board_owners	674	0.1330	0.1950	0.0000	0.9880	607	0.1140	0.1610	0.0000	0.7710	**0.0190***
AV_CAPX	673	0.0500	0.0560	0.0000	0.4170	607	0.0360	0.0460	0.0000	0.3970	**0.0140*****
Av_CEO_CFO	674	0.0640	0.1300	0.0000	0.7340	600	0.0530	0.1060	0.0000	0.6650	0.0100
Av_Exec	674	0.0800	0.1480	0.0000	0.8190	600	0.0650	0.1220	0.0000	0.7500	**0.0150****
AV_GREY	674	0.0390	0.0540	0.0000	0.5600	607	0.0370	0.0530	0.0000	0.4200	0.0030
Av_INDEP	674	0.4320	0.2720	0.0000	0.9530	607	0.3760	0.2560	0.0000	0.9360	**0.0560*****
Av_INS_TOT	674	0.4720	0.2870	0.0000	0.9950	607	0.4120	0.2710	0.0000	0.9730	**0.0600*****
AV_Leverage	674	0.1290	0.1580	0.0000	0.8090	607	0.1990	0.1590	0.0000	0.7220	**-0.0700*****
Av_Non_exec	674	0.0530	0.1300	0.0000	0.9880	600	0.0500	0.1060	0.0000	0.6070	0.0020
Av_other_exec	674	0.0160	0.0530	0.0000	0.6020	607	0.0110	0.0500	0.0000	0.5430	**0.0050***
AV_SIZE	674	17.8200	2.2530	11.8400	23.8800	607	18.6100	2.0720	13.6300	23.890	**-0.7900*****

3.4.2.2: Characteristics of firms by derivatives usage

Fig. 3.1 shows the difference between the performance of users and non-users as well as the trend of their firm performance for 2005 to 2011. Overall, we observe that the performance of the two sub-groups is different. As shown on the graph, non-users tend to have higher Q than derivatives users throughout the sample period. Specifically, in the year that the groups have the worst performance, that is, in year 2009, users have a Tobin's Q value of 1.57 while non-users have a Q of 1.83. In the years of strong performance for the groups, users reported Tobin's Q of 2.75 while that for non-users is 3.04.

In sum, we find that there are differences between firms that have Q and those that have low Q. The univariate analysis does not provide evidence to support arguments in the literature that use of derivatives improves performance. The high Q firms appear to use fewer derivatives compare to the low Q firms (54 v 69 per cents). Nevertheless, we find support for the alignment as well as the monitoring hypothesis. We find that the firms that have high Tobin's have higher percentages of board of directors and institutional ownerships. Further, we find that there are differences between the performance of firms that use derivatives and those that do not use them. Surprisingly, we find that non-users have consistently higher performance than firms that use derivatives throughout the sample period of 2005-2011. Also, we observe a sharp decline in the performance of the two groups during the financial crisis in 2009. The findings in these univariate tests provide preliminary support for our hypotheses.

In Fig. 3.2, we examine the difference between the cash-flow volatility of users and non-users as well as their trend for 2005 to 2011. We find that the cash-flow of non-derivatives users is volatile throughout the sample period, compare to that of derivatives users. Taking together our findings in these sub-section, we find that hedging helps stabilise the cash-flows of derivatives users; however, it has no effect on their performance. Following these revelations, we proceed to the next subsection, where we perform more rigorous tests to examine the effect of hedging on firm performance.

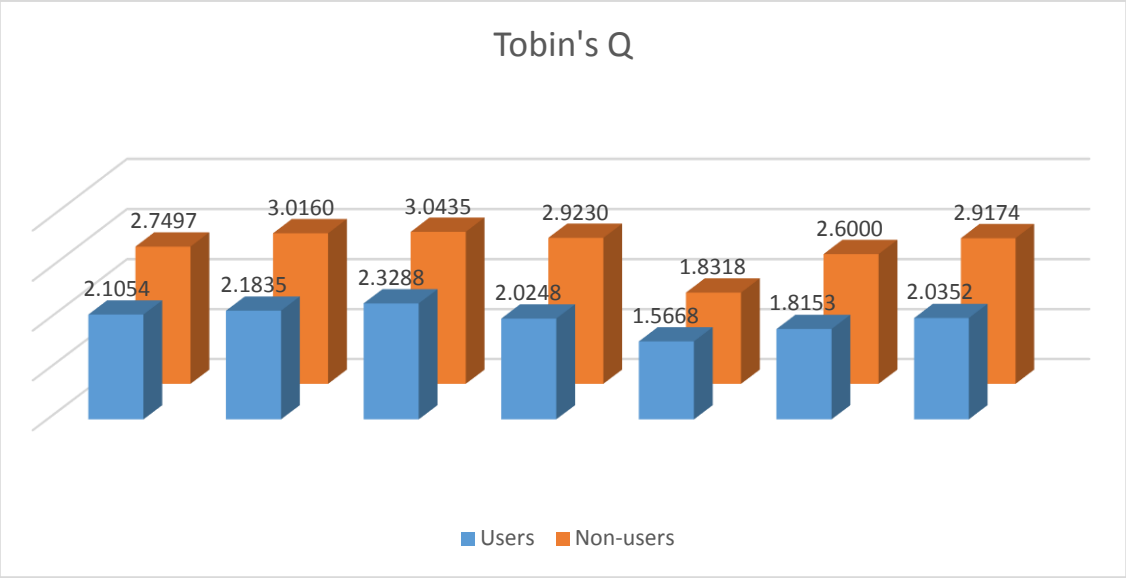


Figure 3:1: Trend of UK firms' performance for 2005 to 2011 - derivatives users and non-users

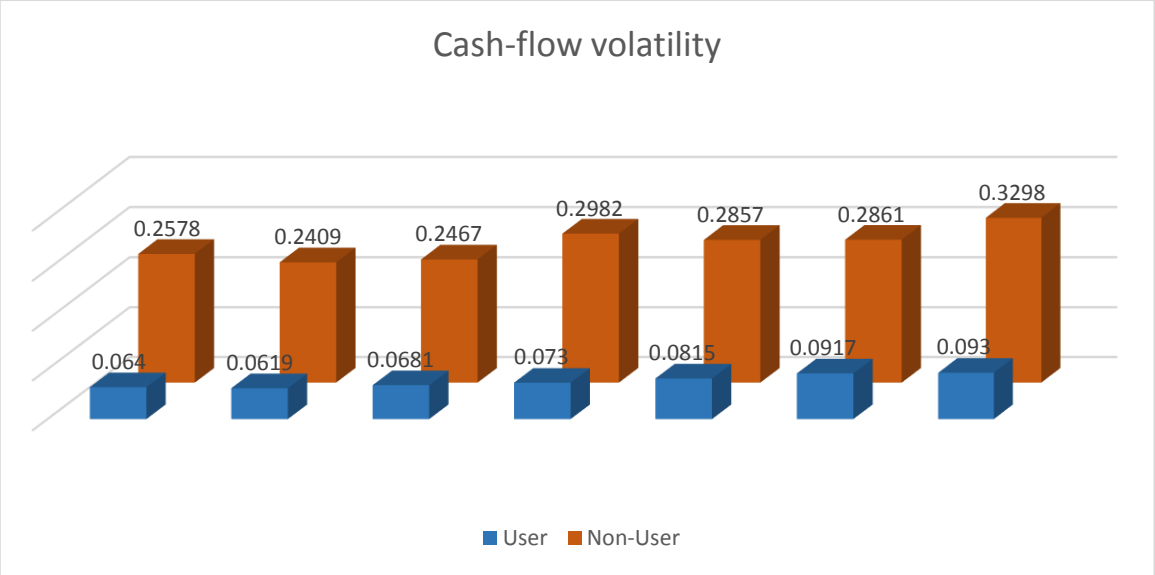


Figure 3:2: Trend of UK firms cash-flow volatility for 2005-2011 – derivatives users and non-users

3.4.3: Multivariate analysis

This section presents the results of the impact of derivative usage on firm performance as well as the joint effect of derivative usage and ownership structure on firm performance.

3.4.3.1: Impact of derivative usage on firm performance

Tables 3.3 to 3.8 present the estimation results from four different methods: the average cross-sectional OLS estimations for each year, pooled OLS regression, in which variables are computed as 2 years average; pooled OLS regression, random-effects linear and treatment effects models that investigate the impact of derivative usage on firm performance. In each table, we control for differences in firm-specific characteristics as well as time and industries effects. Table 3.3 shows the results of our basic model on the association between corporate hedging and firm performance in each year using the average cross-sectional OLS estimators, corrected for heteroscedasticity using the Huber-White-Sandwich. These estimations provide the opportunity to analyse and explore how corporate hedging activities had impacted performance in each year. To conduct the analysis, we compute the average of each regressor (board of directors ownership, institutional ownership, leverage, firm size and CAPX), by using two-year average information. For instance, we compute the 2006 share-ownership of the board of directors as the average of the board of directors' ownership for 2006 and 2005. We then estimate performance at time *t* on the explanatory and vector variables at time *t-1* (see the basic model in Section 3.3.2).

As shown in Table 3.3, the use of derivatives by our sampled firms are has a negative impact on their performance, although the coefficients are not significant. In economic terms, we find that a firm that uses derivatives when the macroeconomic environment is relatively normal may have between 0.179 and 0.404 lower performance than non-derivatives users. On the other hand, a firm that hedges with derivatives during the global financial crisis in 2008 may a have performance increase of about 0.0202 points. The findings are generally consistent with some prior studies that suggest that use of derivatives is more beneficial to firm performance during global economic decline.

Next, we find that the coefficient on institutional ownership is significantly positive during macroeconomic tranquillity at the 5 and 1 per cent levels, but insignificantly positive during the financial crisis. The findings suggest that institutional investors monitor and have

influence on the performance of the firm in which they invest. However, the level of their influence may depend on the certainty that exists in the prevailing macroeconomic environment. This is because institutional investors may tend not to exert more influence on the decisions of their firms during financial crisis, as they might not be clear or have a strong understanding of the available information during financial crisis. Alternatively, the results may simply be reflecting that institutional investors reduce their shareholdings during the financial crisis. Further, we find that the performance of UK firms is negatively and significantly influenced by leverage and firm size in each year except in two cases for each. For example, the leverage coefficients are significant at the 1 per cent and 10 per cent levels in 2006 to 2009; while the coefficients of size are significant at the 1, 5 and 10 per cent levels in 2006, 2007, 2010 and 2011. Firm size coefficients imply that smaller firms in the UK have higher performance. Although geographical diversification seems to generally have positive impact on the performance of our sample, the coefficients are significant in 2011 only. Finally, we find that the dividend dummy negatively (though significantly in 2008 only) impacted firm performance after controlling for other factors. Thereafter, we proceed to the next analysis.

Table 3:3: Average cross-sectional OLS estimation: the effect of hedging on firm performance

This table shows the coefficient of the annual average cross-sectional analysis conducted using the ordinary least square (OLS) estimator with the Stata module *regress*. Firm performance (Tobin's Q) at time *t* is regressed on explanatory variables at *t-1*. All explanatory variables (except the dummy variables) were computed using a two-year average. The standard errors reported in Panel 3 are corrected for heteroscedasticity by using Huber-White-Sandwich estimator of standard errors. Standard errors are reported in parenthesis. Tobin's Q 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. BOARD OWNERSHIP is the percentage of the sum of executive and non-executive directors' shareholdings. MAN_SHARES is the percentage of CEO and CFO shareholdings. INS_TOTSHARES represents percentage of total outstanding shares. Definitions of variables are shown in Appendix 2.3. The signs ***, **, and * represent significance at the 1%, 5% and 10% levels respectively, and are in boldface.

Dependent Variable: Tobin's Q													
	DERIV USAGE	*AVERAGE BOARD OWNERS*	*AVERAGE INS_TOT*	*AVERAGE LEVERAGE*	*AVERAGE SIZE*	*AVERAGE CAPEX*	*DIV*	*GEO*	*IND DIVERS*	*IND DUMMY*	*CONSTANT*	*Obs*	*R-Sq*
2006	-0.1791	-0.4400	**1.2412*** **	**-2.3149*** **	**-0.1964** **	**6.0896*** **	-0.0608	-0.0900	0.1349	Yes	**5.7651*** **	133	0.3996
	(0.2031)	(0.7159)	(0.4011)	(0.6647)	(0.0899)	(1.9221)	(0.3412)	(0.2870)	(0.2060)		(1.7351)		
2007	-0.3580	0.5274	**1.0672** **	**-2.1619*** **	**-0.1281** *	**6.5352*** **	-0.7654	0.2393	0.2233	Yes	**3.7539*** **	156	0.2909
	(0.2628)	(0.7402)	(0.5053)	(0.7304)	(0.0658)	(1.9574)	(0.4700)	(0.3545)	(0.3264)		(1.004)		
2008	0.0202	1.0199	0.6805	**-1.9907*** **	-0.0529	**3.5701** **	**-1.0595** *	0.5092	-0.0235	Yes	**2.2543*** **	161	0.2057
	(0.2845)	(0.8946)	(0.4829)	(0.6644)	(0.0593)	(1.6050)	(0.5457)	(0.3638)	(0.2646)		(0.512)		
2009	-0.0726	0.4169	0.3619	**-0.8804** *	-0.0293	**1.8914** *	-0.0984	0.0459	0.1370	Yes	**1.8419** **	161	0.1644
	(0.1404)	(0.4051)	(0.2841)	(0.4836)	(0.0316)	(1.0021)	(0.1967)	(0.1384)	(0.1318)		(1.066)		
2010	-0.3515	-0.2073	**0.7869** **	-0.2495	**-0.1623*** **	**4.8982** **	-0.2496	0.1656	0.1404	Yes	**4.1574*** **	167	0.2940
	(0.2209)	(0.4606)	(0.3968)	(0.7794)	(0.0595)	(2.3519)	(0.2396)	(0.2138)	(0.2596)		(1.0045)		
2011	-0.4041	2.3055	**1.8627*** **	-0.2228	**-0.2377*** **	6.3825	-0.3187	**0.5420** **	-0.0893	Yes	**6.2413*** **	168	0.2235
	(0.3339)	(1.4841)	(0.7140)	(1.8181)	(0.0841)	(5.0563)	(0.3348)	(0.2738)	(0.2610)		(1.9580)		

In Table 3.4, we report the results of the pooled average cross-sectional analysis corrected for heteroscedasticity and serial correlation by clustering within firms. The way in which we conduct the analysis that is presented in the table is different from the earlier one. In Table 3.4, we pool the average cross-sectional and time-series data in a single model and regress firm performance (Tobin's Q) at time *t* on all explanatory variables at time *t-1*, invoking the OLS estimator using the Stata module *regress*.

We report the results from the basic specification in Model 1 and subsequently alternate some proxies in the remaining models. Specifically, in Model 2, we subdivide the holdings of the board of directors into two: executive and non-executive shareholdings, to investigate the effects of the holdings of each class on firm performance. Model 4 investigates the impact of the chief executives and chief finance officers' holdings on firm performance by replacing Exec_Owners with CEO_CFO and other_execs variables. In Model 5, we focus on the class of institutional investors to examine the effects of two different types of institutional investors' ownership on performance.

In general, the results of the analysis are consistent with the univariate results reported earlier. The coefficient on derivatives usage is negative throughout the specification, although it is statistically insignificant. Specifically, the performance of a firm that hedges with derivatives falls by 0.0240 to 0.0259. This finding suggests that engaging in hedging activities may weaken firm performance, which is not in line with the existing theories. Next, we find weak evidence for the alignment hypothesis. The shareholdings of insiders (Board_owners, Exec_owners, Non_exec_owners, CEO_CFO and other_execs) have a positive effect on a firm's performance, and the economic effect of insiders ownership on firm performance is considerably large (between 0.3724 and 0.5160). However it is statistically insignificant. These findings provide moderate support for Jensen and Meckling's (1976) alignment hypothesis that the divergence of interests between insiders and shareholders may be mitigated when insiders hold shares in a firm, to the extent that they make decisions that would improve firm performance.

Table 3:4: Pooled average cross-sectional estimations: the impacts of hedging

This table provides the coefficients for pooled average cross-sectional estimations using Stata command *regress*. We pooled the average cross-sectional and time-series data by regressing firm performance (Tobin's Q) at time *t* on the explanatory variables at *t-1*, and invoke the OLS estimator command using the Stata module *regress*. All explanatory variables (except the dummy variables) were computed using a two-year average. Model 1 is the base model. In model 2, we replace the measure of board of directors' shareholding with the measure of executive directors and non-directors share-ownerships. In model 3 we replace executive directors' shareholdings with chief executive and chief finance officers' shareholding to examine the effect of chief executive and chief finance officers' shareholding on firm performance. In model 5 we replace total institutional investors shareholdings with the measures of independent and grey investors' shareholdings to examine the type of institutional investors that affect performance and in model 6 we combine the specific measures of executive directors', non-directors', independent and grey investors' shareholdings in a single model. Standard errors are corrected for heteroscedasticity and serial correlation by clustering at firm-level and they are reported in parenthesis. Tobin's Q 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. Definitions of variables are shown in Appendix 2.3. The signs ***, **, and * represent significance at the 1%, 5% and 10% levels respectively, and are in boldface.

Models	(1)	(2)	(3)	(4)	(5)	(6)
Deriv_usage	-0.2594	-0.2410	-0.2407	-0.2410	-0.2583	-0.2399
	(0.1703)	(0.1687)	(0.1687)	(0.1687)	(0.1696)	(0.1680)
Board_owners	0.4967				0.5160	
	(0.4981)				(0.4987)	
Exec_owners		0.4635				0.4871
		(0.7330)				(0.7332)
Non_exec_owners		0.3793	0.3724	0.3787		0.3936
		(0.5824)	(0.5767)	(0.5791)		(0.5822)
CEO_CFO			0.4730	0.4552		
			(0.8964)	(0.9022)		
Other_execs				0.4942		
				(1.1926)		
INS_TOTSHA	**0.9723*** **	**0.9345*** **	**0.9213*** **	**0.9349*** **		
	(0.2994)	(0.3037)	(0.2998)	(0.3045)		
INS_INDEP					**0.9185*** **	**0.8804*** **
					(0.2867)	(0.2899)
INS_GREY					1.6719	1.6328
					(1.2472)	(1.2540)
Leverage	**-1.1114***	-1.0556	**-1.0627***	**-1.0548***	**-1.1280***	**-1.0723***
	(0.6196)	(0.6431)	(0.6343)	(0.6331)	(0.6214)	(0.6450)
SIZE	**-0.1379*** **	**-0.1472*** **	**-0.1482*** **	**-0.1473*** **	**-0.1385*** **	**-0.1476*** **
	(0.0433)	(0.0480)	(0.0477)	(0.0480)	(0.0430)	(0.0477)
CAPX	**4.4334*** **	**4.2871*** **	**4.2255*** **	**4.2923*** **	**4.4613*** **	**4.3141*** **
	(1.2515)	(1.2907)	(1.3093)	(1.3122)	(1.2570)	(1.2961)
Div_dummy	**-0.3913***	-0.3695	-0.3675	-0.3692	**-0.3820***	-0.3601
	(0.2333)	(0.2421)	(0.2445)	(0.2445)	(0.2310)	(0.2398)
GEO_dummy	0.2479	0.2608	0.2569	0.2611	0.2532	0.2662
	(0.1863)	(0.1864)	(0.1844)	(0.1855)	(0.1879)	(0.1879)
IND_divers	0.0688	0.0624	0.0637	0.0621	0.0633	0.0569
	(0.1930)	(0.1944)	(0.1944)	(0.1951)	(0.1942)	(0.1956)
IND_DUMMY	Yes	Yes	Yes	Yes	Yes	Yes
TIME_DUMMY	Yes	Yes	Yes	Yes	Yes	Yes
Constant	**4.2282*** **	**4.4016*** **	**4.4404*** **	**4.4028*** **	**4.2303*** **	**4.4011*** **
	(0.8064)	(0.8878)	(0.8883)	(0.8932)	(0.8064)	(0.8889)
Number of observations	946	940	940	940	946	940
Number of firms	207	206	206	206	207	206
R-squared	0.2287	0.2271	0.2268	0.2271	0.2292	0.2276

Further, we find strong evidence for the monitoring hypothesis. The coefficient on the holdings of all institutional investors (INS_TOTSHA) is statistically positive at the 1 per cent level in models 1-4. Specifically, the performance of firms with institutional investors may increase in the range of 0.9349 and 0.9723. The result provides strong support for the monitoring hypothesis. In terms of the type of the institutional investors that provide the monitoring, the shareholdings of independent institutional investors (INS_INDEP) have a statistically significant, positive effect on firm performance, while the holdings of grey institutional investors (INS_GREY) have a statistically insignificant, positive effect on firm performance. These findings are consistent with our earlier findings in the univariate analysis and supportive of our hypothesis that institutional investors that have fewer business relations with a firm have a better incentive to actively monitor and influence the decisions made by the management.

In addition, the coefficient on leverage is negative and statistically significant at the 10 per cent level in models 1-6, except in model 2. The point estimates range from -1.055 to -1.128, suggesting that firm performance to capital ratio falls by almost 0.16 to 0.13 per cent when the leverage level increases by 0.1. Further, the coefficient on firm size is statistically significant at the 1 per cent level with a negative sign, in all the models. Moreover, the coefficient on the dividend dummy is negative and statistically significant in two cases. These findings are not in line with the financial constraint hypothesis, as small firms are expected to have difficulties in accessing the debt market, which cause them to have insufficient funds to undertake all valuable projects that would improve their performance. However, when we combine these results with those in the univariate analysis above, it appears that the large firms that are in our sample may be having agency problems; hence, they are not actively monitored by the institutional investors and there is misalignment of insiders' interests. This may be the case, considering the fact that the firms with low performance also have low shareholdings of both insiders and institutional owners,

Table 3.5 contains the results from the standard pooled OLS (POLS) estimations that are clustered within firms to correct for heteroscedasticity and serial correlation. This estimation enables us to further investigate the implication of hedging using another econometric specification. The standard pooled OLS is different from the estimated POLS that is in Table 3.4 in two main ways. First, we do not utilise the average values of the variables. Instead, we use the actual values of the variables as reported. Second,

we estimate the standard pooled OLS by making two very important assumptions. In line with previous studies such as Cornett et al. (2007), we assume first that firm performance is observed in the current year under review i.e., at time 1 (y_{it}). Second, we assume that corporate hedging and ownership decisions are made at time 0. To conduct the POLS models, we pool the cross-sectional and time-series data, we regress firm performance proxied by Tobin's Q at 2011 on all explanatory variables that is lagged by one year and invoke the OLS Stata command *regress*.

We report the baseline model in column 1 and six alternative models in the remaining columns. Specifically, in column 2, we separate the board of directors' ownership into executive and non-executive ownerships. This enables us to examine the type of directors that impacts firm performance, in column 3, by replacing the executive ownership variable with the chief executive and chief finance officers' ownership variable (CEO_CFO) to ascertain whether the share-ownership of CEO_CFO adds to performance and in column 4 we include the remaining executive members of the board (OTHER_EXEC) variable. Further, in columns 5 and 6, we re-estimate models 1 and 2 but replace institutional ownership with independent and grey institutional ownerships to explore the type of institutional investors that impacts performance. Overall, all of the estimations are statistically significant, with R-squared that ranges from 0.2265 to 0.2270.

Generally, the results are consistent with the univariate test and support our hypotheses. Specifically, we find that the coefficient on institutional ownership and that of independent institutional ownership are significantly positive at the 1 per cent level in models 1 - 4 and 5 - 6 respectively. A one per cent share held by an institutional investor could lead to almost 87 per cent increase in firm performance and a one per cent share held by an independent institutional investor leads to 83 per cent increase in performance. These findings suggest that institutional investors actively monitor and influence the activities of our sampled firms and monitoring is predominantly carried out by the independent institutional investors. These findings corroborate our earlier evidence.

Table 3:5: Pooled OLS estimation: the effects of hedging on firm performance

This table shows the coefficients for the pooled OLS estimations using the Stata module *regress*. To conduct the analysis, we assume that corporate hedging and ownership decisions were made at time *t-1*, and their effects would be noticeable on performance at time *t*. Thus, we regress firm performance (Tobin's Q) at 2011 on explanatory variables that are lagged by one year by pooling the cross-sectional and time-series data together. Model 1 is the base model. In model 2, we replace the measure of board of directors' shareholding with the measure of executive directors' and non-directors' share-ownerships. In model 3 we replace executive directors' shareholdings with chief executive and chief finance officers' shareholding to examine the effect of chief executive and chief finance officers' shareholding on firm performance. In model 5 we replace total institutional investors shareholdings with the measures of independent and grey investors' shareholdings to examine the type of institutional investors that affect performance and in model 6 we combine the specific measures of executive directors', non-directors', independent and grey investors' shareholdings in a single model. Standard errors were corrected for heteroscedasticity and serial correlation by clustering at firm-level and reported in the parenthesis. Tobin's Q 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. Definitions of variables are shown in Appendix 2.3. The signs ***, **, and * represent significance at the 1%, 5% and 10% levels respectively, and are in boldface.

Models	(1)	(2)	(3)	(4)	(5)	(6)
Deriv_usage	-0.2487	-0.2498	-0.2496	-0.2495	-0.2469	-0.2480
	(0.1732)	(0.1730)	(0.1732)	(0.1733)	(0.1721)	(0.1719)
Board_owners	0.4192				0.4351	
	(0.4672)				(0.4667)	
Exec_owners		0.5179				0.5380
		(0.6831)				(0.6827)
Non_exec_owners		0.2972	0.3052	0.3052		0.3085
		(0.5729)	(0.5711)	(0.5714)		(0.5712)
CEO_CFO			0.5995	0.5899		
			(0.8441)	(0.8489)		
Other_execs				0.2517		
				(1.0357)		
INS_TOTSHA	**0.8748*** **	**0.8668*** **	**0.8581*** **	**0.8644*** **		
	(0.2891)	(0.2905)	(0.2875)	(0.2910)		
INS_INDEP					**0.8310*** **	**0.8219*** **
					(0.2728)	(0.2737)
INS_GREY					1.4132	1.4153
					(1.1815)	(1.1827)
Leverage	**-1.5203*** **	**-1.5132*** **	**-1.5248*** **	**-1.5203*** **	**-1.5341*** **	**-1.5270*** **
	(0.5309)	(0.5303)	(0.5312)	(0.5314)	(0.5309)	(0.5306)
SIZE	**-0.1120*** **	**-0.1098** **	**-0.1093** **	**-0.1089** **	**-0.1123*** **	**-0.1100** **
	(0.0418)	(0.0439)	(0.0440)	(0.0441)	(0.0415)	(0.0436)
CAPX	**3.2944*** **	**3.2593*** **	**3.1989*** **	**3.2239*** **	**3.3184*** **	**3.2823*** **
	(0.9785)	(1.0140)	(1.0250)	(1.0241)	(0.9812)	(1.0165)
Div_dummy	**-0.4055***	**-0.4092***	**-0.4110***	**-0.4115***	**-0.3987***	**-0.4024***
	(0.2352)	(0.2402)	(0.2429)	(0.2428)	(0.2273)	(0.2376)
GEO_dummy	0.2605	0.2640	0.2593	0.2616	0.2655	0.2692
	(0.1864)	(0.1871)	(0.1853)	(0.1857)	(0.1877)	(0.1884)
IND_divers	0.0561	0.0561	0.0596	0.0586	0.0519	0.0519
	(0.1946)	(0.1946)	(0.1945)	(0.1953)	(0.1949)	(0.1948)
IND_DUMMY	Yes	Yes	Yes	Yes	Yes	Yes
TIME_DUMMY	Yes	Yes	Yes	Yes	Yes	Yes
Constant	**3.9034*** **	**3.8642*** **	**3.8708*** **	**3.8541*** **	**3.9026*** **	**3.8619*** **
	(0.7866)	(0.8279)	(0.8311)	(0.8356)	(0.7858)	(0.8280)
Number of observations	947	947	947	947	947	947
Number of firms	207	207	207	207	207	207
LM test	Chi^2 (1) = **301.600*** **					
Hausman test	Chi^2 (14) = **38.5600*** **					
R-squared	0.2265	0.2266	0.2267	0.2267	0.2268	0.2270

Next, we find some evidence for the alignment hypothesis. We find that the percentage of shares held by insiders (that is board of directors, executive, non-executive and the CEO and CFO) has a positive effect on a firm's performance, although the effects are not significant. In columns 1 and 5, we find that firm performance increases by almost 42 to 43.5 per cent when the board of directors hold at least a pound's worth of share in their firms. Also in specifications 2 and 6, which examine the specific type of directors that impact performance, we find that the fraction of shares held by the executive directors has greater economic effects on performance than those held by the non-executive directors. Typically, the columns show that firm performance increases by almost 52 per cent to 54 per cent when executive directors hold at least one pound's worth of their firms' shares, whereas the ratio for non-executive shareholdings range between 29.7 per cent and 30.9 per cent. Our findings seem comparable to past studies that argue that when insiders hold shares in firm, they are likely to reduce empire-building and run the firm more efficiently.

Turning our attention to the derivatives usage variable, we do not find support for the suggestion that use of derivatives positively improves the performance of UK firms. The coefficient on derivative usage is generally negative, but insignificant in models 1 - 6. In economic terms, the performance of a firm that hedges with derivatives may fall within the range of 0.0248 to 0.0250. Further, we find that CAPX (as measured by ratio of capital expenditure to total assets) has a positive impact on firm performance with estimated coefficients that are significant at the 1% level. For the dividends pay-out variable (DIV_DUMMY), we find negative and significant evidence for the impact of dividends on performance. Putting the findings on CAPX and DIV_DUMMY together, our results seem to contradict the explanation in some prior studies that firms pay dividends in order to remove resources from the control of managers. Our results seem to suggest that rather than pay dividends to shareholders, firms that have higher growth opportunities plough back excess cash into their reserves so as to have funds to invest in profitable projects. Finally in Table 3.5, we find that leverage negatively impacts firm performance at the 1% significance level across the different models. The point estimates range from -1.513 to -1.534, suggesting that firm performance to capital ratio falls by almost 0.1513 to 0.1534 when the leverage level increases by 0.1. Also we document that firm size (SIZE) has negative and significant impact on firm performance.

Table 3.6 reports the results from the random-effects estimations with AR(1) disturbance. These estimations provide us with the opportunity to further explore the association that exists between hedging and firm performance using another more efficient estimator. The random-effects (RE) estimator is different from the first three estimators in two main ways. First, the RE estimator is a panel data estimator that measures the information about each firm over time. In so doing, it captures the dynamic behaviour of the relationship between hedging and firm performance (Brooks 2011; Wooldridge 2002). Second, the RE estimator employs an orthogonality assumption that individual firm-level effect is from a random population (stochastic explanatory variables) that is uncorrelated with the explanatory variables and the overall disturbance term. It, thus, parameterises the individual firm-level effect as additional random disturbance (Baum 2006; Wooldridge 2002).

In carrying out RE estimations, we make the same assumptions as in the standard pooled OLS i.e., firm performance is a function of prior year hedging and ownership decisions. Thus, in a panel model, we regress the data of 2011 firm performance (Tobin's Q) on the explanatory variables lagged by one year, and invoke the Stata command xt*regar*. The results in Table 3.6 confirm our earlier findings that hedging with derivatives has negative impacts on the performance of our sample. Specifically, the coefficients on derivatives usage are insignificantly negative at 0.1306 and 0.1325. Also, we find that the holdings of the executive directors, particularly those held by the chief executive and chief finance officers (CEO_CFO), have an insignificant positive association with firm performance. These results support our earlier findings and also provide a weak support for the alignment theory. Further, we confirm that the presence of institutional investors has a positive impact on the performance of firms; however, the impact is statistically insignificant. This finding indicates weak evidence for the monitoring hypothesis. Further, in contrast to our earlier findings, we find in Table 3.6 that there is a positive association between geographical diversification and firm performance, and it is statistically significant at the 5 per cent level. This is a strong indication that firms that diversify into more than one region may take advantage of the capital markets in which they invest, which provides them with funds to undertake valuable projects that enhance their performance.

Table 3:6: Random-effects linear estimations with AR(1) disturbance: the impacts of hedging

This table reports coefficients estimate for Random-effects linear estimations with AR(1) disturbance. We carry out the analysis by making the assumption that firm performance is a function of prior year hedging and ownership decisions. In each model, we regress the data of 2011 firm performance (Tobin's Q) on explanatory variables that are lagged by one year, and invoke the Stata command x*tregar*. Model 1 is the base model. In model 2, we replace the measure of board of directors' shareholding with the measure of executive directors' and non-directors' share-ownerships. In model 3 we replace executive directors' shareholdings with chief executive and chief finance officers' shareholding to examine the effect of chief executive and chief finance officers' shareholding on firm performance. In model 5 we replace total institutional investors shareholdings with the measures of independent and grey investors' shareholdings to examine the type of institutional investors that affect performance and in model 6 we combine the specific measures of executive directors', non-directors', independent and grey investors' shareholdings in a single model. Standard errors are corrected for heteroscedasticity and serial correlation by clustering at firm-level and reported in the parenthesis. Tobin's Q 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. Definitions of variables are shown in Appendix 2.3. The signs ***, **, and * represent significance at the 1%, 5% and 10% levels respectively, and are in boldface.

Models	(1)	(2)	(3)	(4)	(5)	(6)
Deriv_usage	-0.1306	-0.1324	-0.1316	-0.1343	-0.1306	-0.1325
	(0.1441)	(0.1439)	(0.1438)	(0.1439)	(0.1442)	(0.1440)
Board_owners	-0.1663				-0.1671	
	(0.4646)				(0.4661)	
Exec_owners		0.4414				0.4465
		(0.6192)				(0.6227)
Non_exec_owners		-0.7969	-0.7362	-0.7123		-0.7967
		(0.6370)	(0.6385)	(0.6397)		(0.6373)
CEO_CFO			0.8611	0.8900		
			(0.6935)	(0.6948)		
Other_execs				-0.0182		
				(1.516)		
INS_TOTSHA	0.1683	0.1585	0.1767	0.1749		
	(0.2869)	(0.2866)	(0.2856)	(0.2865)		
INS_INDEP					0.1710	0.1516
					(0.3010)	(0.3009)
INS_GREY					0.1452	0.2241
					(0.9007)	(0.9014)
Leverage	**-1.3766*** **	**-1.3753*** **	**-1.3960*** **	**-1.4254*** **	**-1.3766*** **	**-1.3752*** **
	(0.3938)	(0.3932)	(0.3932)	(0.3947)	(0.3940)	(0.3934)
SIZE	**-0.0815***	-0.0730	-0.0666	-0.0666	**-0.0816***	-0.0728
	(0.0492)	(0.0495)	(0.0495)	(0.0496)	(0.0493)	(0.0496)
CAPX	1.1221	1.0791	1.0560	1.0163	1.1218	1.0800
	(0.8002)	(0.8011)	(0.8014)	(0.8016)	(0.8008)	(0.8017)
Div_dummy	**-0.2524***	**-0.2572***	**-0.2629***	**-0.2635***	**-0.2525***	**-0.2571***
	(0.1497)	(0.1496)	(0.1495)	(0.1396)	(0.1498)	(0.1400)
GEO_dummy	**0.3765** **	**0.3806** **	**0.3866** **	**0.3772** **	**0.3764** **	**0.3901** **
	(0.1652)	(0.1651)	(0.1648)	(0.1653)	(0.1653)	(0.1653)
Ind_divers	-0.1711	-0.1749	-0.1693	-0.1676	-0.1709	-0.1750
	(0.1821)	(0.1817)	(0.1816)	(0.1818)	(0.1823)	(0.1819)
IND_DUMMY	Yes	Yes	Yes	Yes	Yes	Yes
TIME_DUMMY	Yes	Yes	Yes	Yes	Yes	Yes
Constant	**3.7614*** **	**3.5832*** **	**3.4387*** **	**3.5078*** **	**3.7627*** **	**3.5792*** **
	(0.9147)	(0.9209)	(0.9186)	(0.9221)	(0.9162)	(0.9228)
Number of observations	947	947	947	947	947	947
Number of firms	207	207	207	207	207	207
R-squared	0.1979	0.1963	0.1961	0.1936	0.1979	0.1963

In sum, the analyses conducted in this section indicate that corporate hedging has a negative association with firm performance, and the results are consistent under different econometric specifications. Specifically, we find that the estimated coefficients of derivative usage in models 1 to 6 ranges from -0.131 to -0.134, and the two point estimates are statistically insignificant. This suggests that use of derivative instruments has negative impact on the performance of UK non-financial firms during the sample periods. In an unreported analysis, we re-estimate the regressions in Tables 3.3 – 3.6 and include cash-flow volatility variable. We find that, apart from observing insignificant volatility coefficients, the results are very similar.

In general, we do not find evidence that use of derivatives has a positive effect on the performance of the sample. However, we find weak evidence that use of derivatives is important to firm performance during a financial crisis. Further, we find strong evidence that contradicts some past studies that find that institutional investors in the UK assume passive roles in firms (Cosh and Hughes 1997; Franks et al. 2001; Goergen and Renneboog 2001). We find that institutional investors actively monitor and exert great influence on decisions made by the firms they invest in. Also, we find evidence that firms that have higher growth opportunities may plough back excess cash into their reserves rather than pay dividends to shareholders, to ensure they have internal funds to invest in profitable projects.

The results of the univariate tests that we discuss in section 2.4.2 (Panel A of Table 2.3) show that hedging and non-hedging firms are different in several aspects. Clearly, there are differences in its debt usage, cash-flow volatility, size and business commitments (foreign exposure, industry and geographical diversification), which suggest that a typical firm may select their derivatives usage because of some expected benefit. For example, it is possible that a firm with high performance may hedge with derivatives for reasons other than to mitigate risks (Allayannis et al. 2012). Also, firms may enter our sample after they decide to hedge, which may potentially lead to a selection bias. If there is selection bias problem in our earlier estimations, our ability to infer a link between hedging and firm performance may have been impaired. This may have been the situation if, in the first place, hedging firms had higher growth options and investment opportunities.

According to Greene (2003; 1990), the problems of self-selection and endogeneity can be corrected empirically using a treatment effects regression. Thus, we assess the potential

impact of self-selection on our results by using a treatment effects model: a Linear regression model with endogenous treatment using full maximum likelihood in a pooled sample of 562 firm-year observations. We replicate the model in the previous tables and employ the *etregress* command in Stata package version 14. The first stage of the procedure is the treatment model that control for selection bias. It is estimated as a probit model that regresses the indicator of firm's decision hedge against firm-specific variables that have been shown to be important determinants in previous studies: leverage, capital expenditure, size and dividend dummy (e.g., Geczy et al. 1997). In addition, we include one other variable, the percentage of firms in the industry that hedge with derivatives, as restrictive exclusion (Allayannis et al. 2012). The second stage of the procedure is the outcome model, which is estimated as an OLS model that regresses the firm performance variable against the same control variables used in the treatment model (except the restrictive exclusion), plus two ownership variables to examine the effects of insiders' and institutional investors' shareholding on performance.

The likelihood ratio test of the null hypothesis that the treatment and outcome models are independent of each other produces an insignificant Chi-squared statistic. This indicates that the decision to hedge does not interfere with the performance of the firms. We also obtain a positive and insignificant coefficient on lambda, suggesting that the coefficient between the hedging decision and the outcome of hedging is statistically insignificant. In so doing, firm performance is not significantly affected by whether firms have a hedging policy in place or not. In addition, we obtain an insignificant coefficient on Rho. Thus, we reject the null hypothesis that there is an endogeneity issue in our model.

Table 3.7 presents the coefficients of the treatment effects model. The first column shows the lambda selection parameter and the coefficients of the treatment model. The second column reports the coefficients of the outcome model. The findings for the treatment model correspond closely to the results reported in Chapter One of this thesis. Further, the evidence in the outcome model confirms our findings in Tables 3.2 – 3.6 that hedgers have a performance disadvantage. Specifically, we find in Table 3.7 that hedging firms have 12.1% lower performance compared to non-hedging firms and it is statistically significant at the 10% level.

Table 3:7: Treatment effects- Linear regression with endogenous treatment

This table display coefficients estimate for treatment effects via maximum likelihood estimation. We carry out the analysis by making the assumption that firm performance is a function of prior year hedging and ownership decisions. In the first column, we report the treatment model that estimates the decision to hedge with derivatives as a function of firm specific variables such as leverage, size, CAPX and an exclusion restriction, the percentage of firms in an industry that hedge with derivatives via Probit estimator. In the second column, we display the outcome model: estimating performance as a function of Board_Owners, TOT_Ins_Owners, and the variables used in the treatment model except the exclusion restriction variable. All explanatory variables, except Ind_divers and Geo_dummy are lagged by one year. Estimation was conducted by using the Stata 14 command *etregress* via full maximum likelihood. Standard errors are reported in parenthesis. Tobin's Q 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. Definitions of variables are shown in Appendix 2.3. The signs ***, **, and * represent significance at the 1%, 5% and 10% levels respectively, and are in boldface.

Models	Treatment	Outcome
	Probit	OLS
Deriv_usage		**-1.2131***
		(0.6773)
Board_directors		0.2520
		(0.2689)
TOT_Ins_Owners		**0.8694****
		(0.1602)
Leverage	**3.6872****	**-1.4578****
	(1.6983)	(0.2601)
CAPX	9.7216	**3.6347****
	(6.3840)	(0.8556)
Div_dummy	**0.9484****	0.0043
	(0.4070)	(0.1205)
Size	0.0824	**-0.0655****
	(0.1162)	(0.0255)
Geo_dummy	0.4095	0.0483
	(0.5700)	(0.1102)
Ind_divers	**-0.7938****	-0.1401
	(0.3858)	(0.0946)
Percent of hedging firms in industry	-0.6931	
	(1.1406)	
Time Effect	Yes	Yes
lambda	0.4751	Yes
	(0.3100)	
Constant	-0.8091	**4.2421****
	(2.0865)	(0.7721)
Pseudo R-squared	0.2944	
Rho		0.5333
		(0.3404)
Sigma		0.8910
		(0.0291)
Likelihood ratio test		1.58
Number of observations	562	562

In Table 3.8 we assess the robustness of our findings by performing another treatment test, i.e., propensity-score matching test. We estimate the probit treatment model using the *teffects psmatch* with ATE (Average Treatment Effect in population) subroutine in Stata 14 and correct for standard error bias using the Abadie and Imbens's (2006, 2011) procedure. As shown in the table, hedging causes performance to reduce by an average of 5% and it is significant at the 1% level.

Table 3:8: Treatment effects- Propensity-scores matching
This table displays the treatment-effects estimation using propensity-score matching. We estimated Probit treatment model using the *teffects psmatch* with ATE (Average Treatment Effect in population) subroutine in Stata 14. Bias-corrected standard error is specified using the Abadie and Imbens's (2006, 2011) method, and is reported in parentheses. The *** represents the 1% significance level, in boldface.

Model	Tobin's Q
Deriv_usage (users vs. non-users)	**-0.5009*** **
	(0.0915)
Observations	1,187

Following our revelations in this section, we proceed to test whether the effect of derivative usage on firm performance under three different macroeconomic situations differ.

3.4.3.2: Impact of derivative usage on firm performance by macro-economic conditions

In this section, we provide an additional estimation to examine the effects of derivatives usage on firm performance based on three sub-sample periods that reflect the prevailing macroeconomic conditions. The period 2005-2007 is categorised as the pre-financial crisis period; 2008-2009 is classified as the financial crisis and 2010-2011 is the post-financial crisis period. For justifications for the categorising of the sample periods see section 2.4.3.2. Investigating the effect of hedging on firm performance in the three macro-conditions is important, as it affords us the opportunity to use the natural experience of the 2008 global financial to ascertain whether the relationship between hedging and firm performance differs in the pre-crisis, crisis and post-crisis sub-samples.

Table 3.9 reports the coefficients, standard errors and the significant levels of the POLS estimations on the impact of derivatives usage on firm performance for the pre-crisis, crisis

and post-crisis periods. We estimate the models[18] by regressing current year firm performance (i.e., Tobin's Q at 2011) against explanatory variables that are lagged by one year, invoking the *regress* command in Stata 14. In the first column, we present the results of the pre-financial crisis. In the second column, we report the results of the financial crisis period and in the last column we report the results of the post-financial crisis period. The reported standard errors are corrected for heteroscedasticity and serial correlation by clustering within firms.

As shown in Table 3.9, there are distinct differences in the hedging impact during the three sub-samples. First, we find that derivatives usage has a positive effect on firm performance during the financial crisis however, the coefficient is not significant. Further, the coefficient on derivatives usage is negative in the normal periods i.e., before- and after- the crisis but, it is statistically significant in the pre-crisis period only. These findings suggest that hedging increases the performance of UK non-financial firms during the financial crisis only but, decreases the performance in normal macro-conditions. These findings are in line with the findings in prior studies such as Allayannis and Weston (2001). Second, we find that the dividend dummy has a negative impact on performance, however; it is significant during the financial crisis period only. Third, we find that the percentage of shares held by the board of directors has a negative effect on firm performance in the period before the financial crisis and a positive effect during a financial crisis and after the crisis period. Although the impact of board of directors' shareholdings is not statistically significant in the three sub-samples, the findings suggest that insiders make efforts to improve the performance of their firms during the crisis by pursuing activities that reduce the effects of the financial crisis.

Following the findings in the sub-section section, we proceed to the next sub-section. In the next sub-section, we examine the joint effect of derivative usage and ownership structure on firm performance by carrying out an analysis which incorporates not only the main effects but also the conditional effects of derivatives usage.

[18] The estimated model in Table 3.9 is a replica of the first model in Table 3.5

Table 3:9: Pooled OLS regression – The impact of derivatives usage on firm performance by macroeconomic conditions

This table shows the coefficients for the pooled OLS estimations for the impact of derivatives usage on firm performance according to the prevailing macroeconomic situation. In column 1, we present the estimation for pre-crisis period, which is the sample period 2005-2007. Column 2 displays the crisis period estimation, which represents the sample period 2008-2009. Column 3 shows the estimation for the post-crisis period, which represents the sample period 2010-2011. We assume that corporate hedging and ownership decisions were made at time t-1, and their effects on performance would be noticeable at time t. Thus, we regress firm performance (Tobin's Q) at 2011 on explanatory variables that is lagged by one year by pooling the cross-sectional and time-series data together, using the Stata module regress in Stata 14. Standard errors were corrected for heteroscedasticity and serial correlation by clustering at firm-level and reported in the parenthesis. Tobin's Q 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. Definitions of variables are shown in Appendix 2.3. The signs ***, **, and * represent significance at the 1%, 5% and 10% levels respectively, and are in boldface.

Models	Pre-crisis	Crisis	Post-crisis
Deriv_usage	**-0.4001***	0.0516	-0.3508
	(0.2074)	(0.1841)	(0.2439)
Board_Owners	-0.1164	0.7463	0.8494
	(0.6238)	(0.5661)	(0.7154)
TOT_Ins_Owners	**0.9337****	**0.5677***	**1.1936*****
	(0.3870)	(0.3393)	(0.4055)
Leverage	**-1.7293*****	**-1.7978*****	**-1.2886***
	(0.6442)	(0.5602)	(0.7296)
Size	**-0.1255***	-0.0454	**-0.1623*****
	(0.0651)	(0.0500)	(0.0500)
CAPX	**4.5456*****	**2.4733****	**4.6783***
	(1.2792)	(1.0818)	(2.4924)
Div_dummy	-0.4277	**-0.5837***	-0.3215
	(0.3725)	(0.3325)	(0.2433)
Geo_dummy	0.1047	0.2705	**0.4397****
	(0.2682)	(0.2363)	(0.2151)
Ind_divers	0.1726	0.0507	0.0234
	(0.2492)	(0.1857)	(0.2266)
Time effect	Yes	Yes	Yes
Industry effect	Yes	Yes	Yes
Constant	**4.0828*****	**2.4714*****	**4.5079*****
	(1.2356)	(0.8280)	(1.0331)
Number of firms	163	172	177
Number of observations	290	322	335
R-squared	0.2730	0.2332	0.2162

3.4.3.3: Impact of derivative usage and ownership structure on firm performance

The earlier empirical results suggested that the use of derivatives on its own does not positively affect performance. However, corporate ownership such as that of the board of director and institutional ownerships provide plausible explanations for the alignment and the monitoring hypotheses. A potential limitation of that investigation is that the effect of derivative usage on performance may be better explained by interacting derivatives usage with the ownership structure that is in place in a firm. This is because a firm that uses ownership structure to mitigate agency problems may not necessarily have need to hedge with derivatives. Hence, if such a firm hedges with derivatives we might observe that the derivatives do not play an important role in its performance. In this subsection, therefore, we estimate a performance equation that examines the joint effects of derivative usage and ownership structure on firm performance. We split our sample into four subgroups based on the median of (1) board of directors' and (2) institutional ownerships and test the hypothesis that derivatives usage has no role in the performance of firms that have high board of directors' (institutional) ownerships. Table 3.10 reports the results from the estimations.

Panel A of Table 3.10 contains the results from the pooled OLS regressions based on the subgroups of board of directors ownerships- that is, firms with high board of directors' ownerships (columns 1 and 2) and those with low board of directors' ownerships (columns 3) and 4). In columns 1 and 3 we include the total institutional ownerships variable, while in columns 2 and 4 we replace the total institutional ownerships variable with the independent institutional investors' and the grey institutional investors' variables. We find that the coefficients of derivatives usage in all the models are negative, although not significant. This finding implies that the use of derivative does not contribute positively to the performance of firms, even at both level of board of directors' ownership. Considering the economic interpretation of the results, we observe that a typical derivative user with high board of directors' ownership may experience a performance fall that ranges from 0.150 to 0.162 while the same user with low board of directors' ownership may have a performance fall ranging from 0.297 to 0.325.

On the consideration of the ownership of the institutional investors in the two subsamples, we find that the institutional investors significantly monitor and exert influence on the performance of firms that have low board of directors' ownership, while the institutional investors team up with the management to invest in unprofitable project that may reduce the performance of firms that have high board of directors' ownership. We find that, for a 1 per cent share held in a firm that has high board of directors' ownership, an institutional investor contributes about 8 per cent to negative performance, compared to a positive contribution of about 100 per cent in a firm that has low board of directors' ownership. These findings suggest that the explanation by past studies, that institutional investors in the UK want to have full control in their firms and therefore would not actively monitor their activities, is inconclusive as such behaviour relates only to the firms that have high board of directors' ownerships. Further, we find that the performance of firms that have high board ownership and those firms that have low board ownership is significantly impacted by leverage, size and capital expenditure; however, geographical diversification appears to matter only to the performance of firms that have high board ownership.

Next, in Panel B of Table 3.10, we report the results from the pooled OLS regressions based on the subgroups of institutional ownerships- that is firms with high institutional ownerships (columns 1 - 3) and those with low institutional ownerships (columns 4 and 6). In columns 1 and 4 we include the board of directors' ownership variable, in columns 2 and 5 we replace the board of directors' ownerships variable with the executive and non-executive ownership variables, while in columns 3 and 6 we replace the executive ownerships variable with the share-ownerships of the chief executive and chief finance officers as well as those held by the other executive directors. These tests allow us to examine the effect of the different classes of insiders on the performance in the subsamples. We find that the joint effect of derivative usage and institutional ownership on performance is negative and insignificant in all models. Specifically, the coefficient on the derivatives usage for firms that have a high institutional ownership ranges from -0.221 to -0.222; while the same coefficient ranges from -0.226 to -0.233 for firms that have a low percentage of institutional ownership. There appears to be not much difference in these coefficients. We therefore interpret these findings as additional evidence that use of financial derivatives does not have an important role in the presence of institutional investors, which is efficient enough to curb agency problems.

Further, the effect of the board of directors' ownership is negative and significant at the 10% level for firms that have high institutional ownership, while it is positive and insignificant for firms that have low institutional ownership. These results support our earlier findings and are consistent with the expropriation and alignment hypotheses, respectively. We find further evidence for potential expropriation in firms that have high institutional ownership in that the coefficient of executive, non-executive, chief executive and chief finance officers' ownership as well as that of the other executive directors are negative, though, the coefficient is not significant. On the other hand, we find evidence that supports the alignment hypothesis in firms that have low institutional ownership, in that the effects of the executive, non-executive, chief executive and chief finance officers as well as that of the other executive directors' performance are positive.

In summary, the results clearly provide evidence that there is no difference between the performances of firms that hedge with derivatives under different levels of ownership structures; that is, high board of directors (institutional) and low board of directors' (institutional) ownership. The firms that have low board of directors' ownership use less debt and invest in more capital projects than firms that have high board of directors' ownership. Also, the former group of firms tend to face significant monitoring and influences from the institutional investors compared to the latter group. These findings are consistent with the alignment and monitoring theories. On the other hand, firms that have high board of directors' ownership make better use of the different geographical regions that they invest in; however they do not enjoy active monitoring from the institutional investors. Further, we find that the firms that have high institutional ownership seem to face severe board of directors-shareholders interest misalignment. Our findings imply that the derivatives usage by firms that have a high ownership structure may not have an important role on their performance. In the next section, we carry out further checks by examining factors that affect the performance of derivatives users and non-users.

Table 3:10: Pooled OLS estimations: corporate hedging, ownership structure and firm performance
This table reports the moderation impact of ownership structure on relation between derivative usage on firm performance by splitting the sample based on the level of board of directors and institutional shareholdings. Panel A reports the results of pooled OLS regression for subsamples of high and low board shareholdings; while panel B reports the results for pooled OLS regression for subsamples of high and low institutional shareholdings. High (low) board ownership represents percentage of board of directors' shareholding greater (lower) than median at time *t-1* and High (low) institutional ownership represents percentage of total institutional shareholding greater (lower) than median at time *t-1*. The explained variable is Tobin's Q, measured as total assets minus the book value of equity plus the market value of equity divided by the book value of assets. Derivatives usage equals one if a firm uses currency, interest and/or commodity derivative instruments for hedging purposes, zero if otherwise. All other variables are defined in Appendix 2.3. The standard errors are corrected for heteroscedasticity and clustered within firm. The stars ***, ** and * connote significance at the 1%, 5% and 10% levels respectively.

Models	High Board Ownership		Low Board Ownership	
	(1)	(2)	(3)	(4)
Panel A:				
Deriv_usage	-0.1622	-0.1498	-0.3249	-0.2969
	(0.2238)	(0.2270)	(0.2342)	(0.2297)
INS_TOTSHA	-0.0802		**1.2099*** **	
	(0.4140)		(0.2927)	
INS_INDEP		0.0485		**1.0083*** **
		(0.3978)		(0.2851)
INS_GREY		-1.9789		**3.0977***
		(1.6931)		(1.8268)
Leverage	**-1.8392****	**-1.8029****	**-1.2492****	**-1.3517****
	(0.8352)	(0.8436)	(0.5342)	(0.5341)
SIZE	**0.1942*** **	**-0.1951*** **	**-0.1001****	**-0.0977****
	(0.0728)	(0.0725)	(0.0479)	(0.0468)
CAPX	**3.2237****	**3.0639****	**3.5158*** **	**3.4370*** **
	(1.3068)	(1.3225)	(1.2144)	(1.2066)
Div_dummy	-0.2818	-0.2950	-0.2731	-0.2364
	(0.2595)	(0.2605)	(0.3091)	(0.3003)
GEO_dummy	**0.5637****	**0.5342***	0.0368	0.0291
	(0.2740)	(0.2897)	(0.2288)	(0.2269)
IND_divers	-0.2798	-0.2598	0.2662	0.2636
	(0.2600)	(0.2601)	(0.2758)	(0.275)
IND_DUMMY	Yes	Yes	Yes	Yes
TIME_DUMMY	Yes	Yes	Yes	Yes
Constant	**5.4988*** **	**5.5240*** **	**3.5646*** **	**3.5438*** **
	(1.2035)	(1.1892)	(0.9233)	(0.9156)
Number of observations	460	460	487	487
Number of firms	102	102	130	130
R-squared	0.2161	0.2192	0.3348	0.3408

Models	High Institutional Owners			Low Institutional Owners		
	(1)	(2)	(3)	(4)	(5)	(6)
Panel B:						
Deriv_usage	-0.2221	-0.2222	-0.2209	-0.2261	-0.2328	-0.2315
	(0.2545)	(0.2579)	(0.2584)	(0.1729)	(0.1696)	(0.1712)
Board_owners	**-1.6025***			0.6901		
	(0.8437)			(0.5237)		
Exec_owners		-1.6097			0.8312	
		(1.0569)			(0.7562)	
Non_Exec_owners		-1.5957	-1.5757		0.5038	0.5284
		(1.0484)	(1.0476)		(0.5922)	(0.5971)
CEO_CFO			-1.7431			1.0238
			(1.2016)			(0.9949)
Other _execs			-0.3952			0.2035
			(5.8605)			(1.0006)
Leverage	**-1.6333*****	**-1.6330*****	**-1.6229*****	**-2.1605*****	**-2.1312*****	**-2.1585*****
	(0.5808)	(0.5919)	(0.5862)	(0.6965)	(0.6913)	(0.7007)
SIZE	**-0.0870***	**-0.0872***	**-0.0874***	**-0.1411****	**-0.1373****	**-0.1338****
	(0.0480)	(0.0521)	(0.0515)	(0.0561)	(0.0574)	(0.0574)
CAPX	**4.3658****	**4.3653****	**4.4540****	**2.7653*****	**2.6681****	**2.5557****
	(1.9506)	(1.9392)	(1.9343)	(1.0500)	(1.0536)	(1.0673)
Div_dummy	-0.3121	-0.3120	-0.3198	**-0.4552***	**-0.4608***	**-0.4733***
	(0.3262)	(0.3260)	(0.3252)	(0.2622)	(0.2707)	(0.2807)
GEO_dummy	0.3345	0.3345	0.3305	0.3301	0.3335	0.3243
	(0.2648)	(0.2652)	(0.2796)	(0.2542)	(0.2560)	(0.2522)
IND_divers	0.1295	0.1295	0.1234	0.0865	0.0924	0.0998
	(0.2453)	(0.2460)	(0.2557)	(0.2495)	(0.2480)	(0.2479)
IND_DUMMY	Yes	Yes	Yes	Yes	Yes	Yes
TIME_DUMMY	Yes	Yes	Yes	Yes	Yes	Yes
Constant	**3.8394*****	**3.8421*****	**3.8399*****	**4.6893*****	**4.6246*****	**4.5872*****
	(0.9863)	(1.0636)	(1.058)	(1.1157)	(1.1581)	(1.1782)
Number of observations	483	483	483	464	464	464
Number of firms	136	136	136	112	112	112
R-squared	0.2262	0.2262	0.2264	0.2867	0.2871	0.2880

3.5: Further Checks

So far, our results seem to be consistent within various econometric specifications. In this section, we estimate a series of models as additional checks that enable us to be more specific in our investigation of the factors that impact performance. We separate our sample into sub-groups based on whether the firm hedges with derivatives or not and perform similar regressions for the two groups using pooled OLS estimations. By using derivative users and non-users as our classification criterion, we can ascertain whether the performance of users and non-users is impacted by different characteristics. The results of the estimations are presented in Appendix 3.1.

The results presented in Appendix 3.1 show that the percentage of shares held by institutional investors (INS_TOTSHA) has a positive and significant impact on performance for both

derivative users and non-users, although the economic significance of the coefficient on institutional ownership is greater for non-users; it ranges between 0.741 and 0.772 for users and from 1.219 to 1.246 for non-users. For the type of institutional investors that impact performance among the two sub-groups, we find positive and significant effects of independent institutional ownership for both groups of firms with greater economic significance for non-users (1.203-1.232) than users (0.749-0.763). Furthermore, we find that the relation between performance and board of directors' shareholdings (BOARD_OWNERS) for both derivative users and non-users is positive; however, it is weak. These results in economic terms imply that when the board of directors of non-user firms hold a percentage of their firms' outstanding shares they tend to contribute positively about 0.807 to 0.813 to their firm performance, compared to about 0.261 and 0.262 contribution that is made by boards of directors that hold shares in user firms. This finding is consistent with our view that the performance of derivatives users and that of non-users is impacted by a variety of firm-level factors. To be more specific, the performance of derivatives users may be more impacted by factors other than insiders' and institutional investors' ownerships.

Another interesting finding of this chapter relates to the other independent variables. We find that the performance of firms that use derivatives is significantly impacted by leverage and Capex; while the performance of firms that do not hedge with derivatives is significantly influenced by size of the firm, Capex and geographical diversification variables.

3.6: Conclusions

Firm performance is crucial for economic viability and going concerns but the number of firms that have concerns about their performance is becoming alarming. In this chapter, we examine these two important questions: (1) what is the impact of financial derivative instruments on the performance of UK firms, that is, supposing that firms had hedged their exposures? (2) How does the interaction between their derivative usage and the ownership structure that is place in the firms affect their performance? Several important features are considered in this chapter, which we believe add several novel insights to the existing understanding on the factors that impact firm performance. First, the chapter employs new firm ownership structure data that is carefully and uniquely collected by hand. Second, the sample periods that are used in the study includes a time of financial crisis 2008-2009 which affords the chapter the unique opportunity to present findings from a natural experience of a financial crisis. Third, we

compute some of the explanatory variables that were used in our regression by using average data, which we believe controls for possible measurement errors and extreme values that might be present in a particular year. Last, distinct from prior empirical studies on the implications of derivative usage, we effectively control for the endogeneity problem that may arise in our examination of the unconditional impacts of derivative usage on firm performance by (1) introducing firm ownership structure variables into our estimations to serve as exogenous variables; (2) estimating a partial dynamic performance equation. We estimate that firm performance at time *t* is a function the explanatory variables at time *t-1*.

Analytically, we find that the use of derivatives does not positively impact firm performance. In particular, we find evidence that firms that hedge with derivatives may experience worse performance than firms that do not hedge with derivatives. The use of derivatives appears to be important for firm performance during the global financial crisis in 2008, but a performance-destroying strategy during normal macroeconomic conditions. Interestingly, the firms that have high performance use fewer derivatives, they are smaller and more profitable and less likely to face financial constraints as they distribute less dividend to shareholders. In contrast, the firms that have low performance appear to use more derivatives, are larger, more levered, and less profitable and have higher percentages of board of directors and institutional ownerships. We also find that non-hedgers are more profitable than hedgers and their performance is significantly different from that of hedgers. Also, institutional investors tend to be very active in the group as they show higher coefficients than hedgers. These findings suggest that although the non-hedgers may not find it very easy to access the derivatives market because it is too sophisticated for them, this group of firms may strategically be exploring other capital markets in the different regions in which they invest in order to obtain finances to fund their profitable projects; and the few institutions that invest in such firms are active in monitoring the investment activities.

Further, our results extend the previous literature on corporate derivatives usage and firm performance. We investigate the joint effect of derivative usage and ownership structure on firm performance. If the relationship that exists between derivative usage and firm performance is subject to market frictions like agency problems between managers and shareholders and if ownership structure can be used to reduce that problem then, to the extent that board of directors and institutional investors hold shares in firms, the interaction of derivative usage and ownership structure should have no role to play in performance. We find

evidence that there is no performance benefit associated with the use of derivatives when ownership structure is high. This is because there appears to be no difference between the performances of firms that have high ownership and the firms that do not. When the board of directors' ownership stake is high, the institutional investors may corroborate with decisions made, even if such decisions is unprofitable. These findings suggest that institutional investors may not have incentive to monitor and exert influence on the performance of all types of firms. We observe that when the institutional investors' stake is also high, boards of directors make decisions that may erode the firm's wealth. In summary, the chapter has provided plausible evidence that could have huge implications in the corporate and academic environments that the performance of firms may be jointly impacted by risk management policies and ownership structure.

This chapter offers two important implications for future research. First, our study highlights the role of the prevailing macroeconomic conditions on the relation between derivatives usage and performance. However, this study does not investigate how the prevailing macroeconomic situation has impacted the interaction of derivatives usage and ownership structure on performance. Second, our results indicate that joint effect of derivative usage and ownership structure plays no role in firm performance. Thus, future research may examine whether the unconditional effects of hedging on firm performance differ during a financial crisis period.

CHAPTER 4: FINANCIAL CONSERVATISMS AND CORPORATE HEDGING

4.1: Introduction

Financial conservatism is a situation whereby firms maintain a substantially lower leverage than is predicted by prominent capital structure theories, and to the extreme, some firms even have no debt in their capital structures. The trade-off theory of corporate capital structure suggests that firms carefully weigh the benefits of debt financing against agency costs and the costs of financial distress to ensure that they do not deviate from their optimal level, and in so doing, avoid the negative consequence of facing reduced risk-adjusted returns or even possible failure (Jensen and Meckling 1976; Kraus and Litzenberger 1973). The pecking-order theory suggests that features of imperfect capital markets such as information asymmetry may induce firms to prefer debt financing rather than equity, which may be more sensitive to mispricing when their internal resources are insufficient to finance valuable projects (Myers 1984; Myers and Majluf 1984). Also, the free-cash-flow theory argues that, to the extent that debt would commit managers to debt repayment, firms may issue more to reduce the excess cash-flow that managers might have deployed to negative NPV projects (Jensen 1986).

Despite the arguments of the existing capital structure theories, financial conservatism has become prominent among non-financial firms and the number of conservative firms has increased in recent years (Graham 2000; Graham and Rogers 2002; Lemmon et al. 2008). According to D'Mello and Gruskin (2014), the percentage of firms that follow a conservative leverage policy increased from 14.01 per cent in 1977 to 34.42 per cent in 2010. An increasing stream of study in corporate finance attempts to analyse the reasons why firms eschew debt despite its potential tax benefits (Bessler et al. 2013; Byoun and Xu 2013; Dang 2013; Devos et al. 2012; Graham 2000; Lemmon et al. 2008; Miller 1977; Strebulaev and Yang 2013). A strand of those studies investigate the determinants of financial conservative policy by focusing on the combination of low-leverage and cash-holding rather than presenting a holistic investigation into the puzzling leverage conservatism phenomenon (Bigelli et al. 2014; Iona et al. 2007; Marchica and Mura 2010). Other contemporaneous studies position their analysis entirely on a specific aspect of leverage conservatism policy, for instance, Bessler et al. (2013)

and Dang (2013) focused on motives for zero-leverage policy, while another line of studies that investigate zero-leverage phenomenon gives only brief attention to low-leverage policy (Byoun and Xu 2013; Minton and Wruck 2001; Strebulaev and Yang 2013). Both strands of literature argue that the understanding of zero-leverage firms would provide insight about low-leverage firms (Korteweg 2010; Strebulaev and Yang 2013). This assertion may be unjustified, as firms with a zero-leverage policy and those with a low-leverage policy may have different characteristics (Byoun and Xu 2013). Also, there is a possibility that some low-leverage firms have optimal behaviour, and as such they may be able to operate and survive for many years without being targeted for acquisition (Chung et al. 2013), while it may not be so in the case of zero-levered firms.

Thus, in this chapter, we are interested in holistically investigating the financial conservatism by analysing different types of leverage conservative policy, from low-leverage conservatism to the most extreme form. In doing so, the chapter focuses on three main research questions. The first research question we explore is: how does financial constraint influence firms' decision to be financially conservative? The financial constraints hypothesis argues that, in the presence of capital market imperfections, some firms may find it difficult to access the debt markets to obtain sufficient funds to finance valuable projects and therefore may be financially conservative. In line with the hypothesis, we expect a positive association between the financial constraints and financial constraints. Then, we explore the second question: does an underinvestment problem induce firms to follow financial conservatism? The underinvestment theory suggests that high-growth firms may follow a conservative leverage policy to reduce the conflict of interests between shareholders and debt-holders (Myers 1977). Thus, the underinvestment hypothesis predicts positive associations with financial conservatism. Then, we proceed to the next research question, which explores the role of corporate ownership structure in financial conservatism decisions. The role of ownership structure on firms' decision to adopt financial conservatism policies is left to the empirical study, as there are two conflicting arguments for managerial ownership, i.e., the alignment and entrenchment hypotheses; and the monitoring hypothesis for institutional ownership.

Further, we investigate whether corporate hedging plays a role in firms' decisions to be financially conservative. It is argued that macroeconomic conditions may affect capital structure decisions (Antoniou et al 2008; Erel et al 2012; Korajczyk and Levy 2003). Dang (2013) shows that some firms may follow a conservative policy when macroeconomic

conditions are not conducive for borrowing: such as when the term structure of interest rates is widened. Bessler et al. (2013) report that there is a positive association between financial distress costs and volatility, which will induce firms to follow a conservative leverage policy, particularly when there is an increase in business risk. Corporate hedging literature argues that firms that hedge may be able to reduce cash-flow volatility and financial distress costs, as they may have easy access to credit markets to meet obligations because the market believes they are less likely to violate financial covenants (Campello et al. 2011; Disatnik et al. 2014; Froot et al. 1993; Smith and Stulz 1985). Thus, we predict that corporate hedging has a negative influence on a firm's propensity to be financially conservative.

We conduct our empirical analysis in several stages using the FTSE All Share firms, over 2000-2013. In the first stage of the analysis, we attempt to identify the financially conservative firms that are in our sample. Most previous studies on the debt-conservatism policy identify the financial conservative firms that are in their sample by utilising the fixed classification method (Byoun and Xu 2013; Minton and Wruck 2001; Strebulaev and Yang 2013). For instance, Strebulaev and Yang (2013) used a 5 percentile cut-off point to identify firms that follow an almost zero-leverage policy. Also, Minton and Wruck (2001) employed a 20 percentile cut-off point to identify low-levered firms in their sample. This method of classification may be considered too rigid as it does not take into consideration the fact that firms may sometimes change their leverage status. Also, such a classification may provide too vague a classification of low-leverage firms. This is because such a method of classification assumes that all firms that have a low-leverage policy are homogenous and thus they all behave optimally (Dang 2013; Minton and Wruck 2001; Strebulaev and Yang 2013). Thus, without knowing each firm's optimal leverage level, it may be possible to wrongly classify firms as being low-levered.

As a result of the earlier explanation, this study attempts to investigate the motives for financial conservatism policy by focusing on the optimal leverage level of each firm. We argue that, to effectively classify a firm as conservatively levered or not, it is important to know whether the actual leverage the firm has is optimal leverage or not. Consider two hypothetical firms A and B that have 7% and 38% debt respectively in their capital structure. Classifying firm A as low-levered and firm B as highly-levered might be a misconstrued effort. This is because firm A may be over-levered even with 7% debt, while firm B may be under-levered; thus, unless we know each firm's target leverage level, our classification may be wrong.

Furthermore, it is suggested in the literature that there might be no need to be concerned with firms with suboptimal leverage levels, as firms with suboptimal leverage behaviour may already be at competitive disadvantage, as they are less likely to sustain profitable operations and may be more likely to fail (Chung et al. 2013). Thus, we, in the first stage of the analysis, follow previous literature such as Ozkan (2001) and estimate a leverage model as a function of profitability, growth opportunities, tangibility and firm size using the System GMM (SYS-GMM) estimator. In the second stage, we utilise the fitted values obtained from the leverage model to predict the annual optimal leverage level for each firm.

Then, in the third stage, we construct four different proxies to represent four different types of financial conservatism firms. The first class of financially conservative firms are those firms with a leverage level that is lower than both the optimal leverage and industry average levels, and are called the low-levered firms. The second type of conservative firms are firms with leverage that does not exceed 5 per cent of both the predicted leverage and their industry average, and are the nearly low-leverage. Then, we identify a third category of conservative firms. These are firms that have a leverage level lower than or equal to 1 percent of both the optimal leverage and industry leverage level, and are the nearly zero-leverage. To enable us to have a good understanding of financial conservatism policy and to be able to compare our results with previous studies, we identify the final class of conservative firms as those firms with no outstanding debt in a given year, the zero-leverage firms. We assign the value of 1 to each firm in each category of conservatism that satisfies the condition and 0 otherwise.

The methodological framework in which we identify the financially conservative firms that are in our sample represents the first important contribution of this study. The study does not assume that all firms with a low leverage policy behave optimally. We believe that making such an assumption may have serious consequences for our classifications and may lead to wrong inferences that may make no economic sense if we explain a suboptimal leverage level. The second important contribution of this study is that the conservative firms in our sample are carefully classified having taken into account very important factors like asymmetric information, profitability and financial constraints. The third contribution of the framework is that we impose an additional criterion that a firm must satisfy before it can be classified as having a conservative policy, i.e., actual leverage that is lower than the industry average. Imposing the additional criterion that a firm's leverage level must be lower than the industry average enables us to take into account the possibility that some unprofitable firms might have

a higher leverage level than the optimal one, although, they would not have a higher leverage level than the profitable firms in their industry (Ozkan 2001).

Having identified the financially conservative firms, the study proceeds to the fourth stage, which involves estimating several logistic regressions to empirically analyse the factors that motivate firms to follow the earlier explained four different conservative financial policies, namely: low-leverage, nearly low-leverage, nearly zero-leverage and zero-leverage, by concentrating on the prominent capital structure and ownership structure theories. Investigating the determinants of the four different classes of leverage conservative policies in a single study differentiates our study from the previous ones, as we do not assume that understanding of a firm's motive for a particular conservative policy may be generalised to other policies (Korteweg 2010; Strebulaev and Yang 2013). We believe that a study of this nature can broaden our knowledge and understanding, as it provides further insights on why firms follow each conservative policy. In the last stage, the study investigates the role of hedging in financially conservative policies by estimating several logistic regressions. In so doing, we utilise hand-collected hedging data over 2005-2011, which is defined as a ''binary indicator'' that takes a value of 1 if a firm uses at least one of the following financial derivative instruments, foreign currency, interest rate, and commodity derivatives for hedging purposes and 0 otherwise.

The study on the role of hedging on conservative policy begins in 2005 because it became mandatory for UK firms to report their use of derivatives instruments following the International Financial Reporting Standards (IFRS) regulation. Previous empirical study that investigates the motives for leverage conservatism focuses on the effects of financial constraints (Dang 2013), underinvestment and financial flexibility (Dang 2013), managerial entrenchment (Devos et al. 2012; Strebulaev and Yang 2013) and macroeconomic conditions (Dang 2013). While we do not deny that these factors are important in explaining firms' decision to be conservative, we believe that our investigation into the role of corporate hedging on conservatism adds to literature on financial conservatism and risk management, in that to the best of our knowledge no previous investigation has been conducted that links the two policies.

Our empirical analyses reveal several important findings. First, we find that characteristics of our sampled firms depend on the type of financial conservatism policy they adopt. Specifically,

low-levered firms are larger, have fewer growth opportunities and use more financial derivatives compare to the nearly low-levered, nearly zero-levered and the zero-levered firms. Also, low-levered firms hold smaller cash balances and have few investments in capital expenditure as well as have the highest share-holdings of independent investors. The zero-levered firms, on the other hand, are the smallest with considerably more valuable growth opportunities, hold large cash balances and use fewer derivatives compared to the low-levered, nearly low-levered and nearly zero-levered firms. These findings partly explain why they avoid debt, as very small firms are more likely to be credit constrained (Hadlock and Pierce 2010). Second, we find that the percentage of firms that follow leverage conservatism (for the four types of leverage conservatisms) policies falls during the financial crisis from what it was prior to the crisis and subsequently increases again after the crisis. This finding indicates that leverage conservatism might be pro-cyclical. Further, we find that the zero-levered firms have the highest percentage of insider shareholders.

Next, on the investigation of the role of derivatives usage on leverage conservative policies, we find evidence in support of our arguments, that firms that use derivatives to hedge do not have the incentive to adopt conservative leverage policies, particularly low-levered and nearly low-levered policies. This is in line with the proposition that hedging firms would not find it difficulties to access funds at debt market, as the market would perceive the hedging policy as a guarantee that shareholders would not share among themselves the payment meant for debt-holders as dividend (Smith and Stulz 1985). In sum, in line with our hypothesis, financial constraints and derivatives usage significantly induce a firm's decisions to follow conservative (LL, NLL, NZL and ZL) policies. On the other hand, the underinvestment problem contributes to the NLL, NZL and the ZL decisions but not the LLs'.

The remainder of this chapter is organised as follows. Section 2 reviews some important literature on leverage conservatism, and then develops some testable hypotheses based on existing theories and empirical literature. Section 3 describes the data and analyses the characteristics of low-leverage firms and the two main classes of low-leverage firms: low leverage with derivatives and low-leverage firms without derivatives. In this section, we also discuss all the methods that were used in conducting the research. Section 4 provides an empirical analysis of firms' propensity to follow a low-leverage policy. In section 5 we provide further checks, section 6 reports sensitivity analysis, and finally, section 7 concludes.

4.2: Literature Review and Development of Testable Hypotheses

In this section we present some of the directions of the past studies on capital structure and leverage conservatism as well as develop some hypotheses that we test in this chapter based on the gap that this study is intended to fill.

4.2.1: Literature review

According to the proposition of Modigliani and Miller (1958), the capital structure policy does not matter in a perfect capital market because firms may not derive any benefit from devoting time and efforts to such policy. One of the central reasons for the theory is that in a perfect capital market, there is symmetric information (in both quality and quantity) between the firm and fund providers, and thus, the market would not require additional costs from firms that seek external funds. In so doing, a firm may not find it costly at any time to access at the market to obtain funds to undertake valuable projects. However, in the presence of capital market imperfections and frictions such as costly financial distress/bankruptcy, corporate and personal taxes, information asymmetries and agency problems, a firm's capital structure policy does matter and it is very important according to the trade-off, pecking-order and market timing theories.

The trade-off theory says that the leverage that a firm carries in its balance sheet is a function of its optimal capital structure after carefully balancing the tax benefits of debt financing against the costs of financial distress/bankruptcy (Kraus and Litzenberger 1973) and agency costs (Jensen and Meckling 1976). The pecking-order theory, on the other hand, postulates that in the presence of adverse selection arising from information asymmetry, a firm would prefer to issue more debt than equity when retained earnings are not sufficient for funding valuable projects, as debt is less risky (Myers 1984; Myers and Majluf 1984). Then the market timing theory argues that firms consider the cost of capital and would issue equity only when share price is high (Baker and Wurgler 2002). By implication, firms are expected to lever up to be able to finance their projects. However, extant literature reveals that firms are in recent times following leverage conservatism by carrying a low level of leverage and in extreme cases some firms do not even have any debt in their balance sheets (Dang 2013; D'Mello and Gruskin 2014; Graham and Rogers 2002; Strebulaev and Yang 2013). A few studies have made explicit attempts to understand why firms are conservatively levered. This body of

studies can be categorised into studies that examine the firm-level determinants of zero-leverage, studies that examine the firm-level determinants of low-leverage policy and finally, studies that examine the determinants of zero-leverage policy at the international level. In general, studies on leverage conservatism suggest that firms that pay more taxes and dividends, have higher market to book, higher cash balances and that are small in size have the propensity to follow leverage conservatism policies.

The line of studies that examine the determinants of zero-leverage include (Byoun and Xu, 2013; Dang 2013; Devos et al. 2012). Byoun and Xu (2013) argue that in the presence of high equity market valuations, firms that face borrowing constraints may become conservative with their leverage as they would prefer to use equity financing. This is because frequently turning to the equity markets to finance projects may, over time, give firms a comparative advantage; hence they become debt conservative. Using a sample of UK firms over the period 1980-2007, Dang (2013) examines whether firms follow a zero-leverage policy because they cannot obtain funds at the capital markets to finance positive NPV projects or as a strategic move to mitigate underinvestment problems. The study reports that the characteristics of zero-leverage firms are not homogeneous and that dividend paying firms adopt a zero leverage policy for strategic reasons, particularly, to reduce the under-investment problem and to preserve their financial flexibility, thereby enhancing the ability to make investments in future growth opportunities. Non-dividend paying firms, on the other hand, become conservative simply because they are financially constrained. Further, Devos et al. (2012) explore the quality of corporate governance mechanisms and managerial entrenchment as possible reasons why firms follow conservative policies. They argue that a strong corporate governance mechanism should make a firm increase its leverage level if entrenched managers adopt zero-leverage policies for the sub-optimal reason of eschewing the disciplinary pressures of debt. Using a cross-sectional sample of U.S non-financial firms, Devos et al. (2012) report that zero-levered firms do not have weak corporate governance mechanisms and that the boards of directors of the firms monitor the managers and discipline them for poor performance. Thus, they express that managerial entrenchment does not play a major role in zero-leverage policy.

Bessler et al. (2013) used a sample of over 32,000 firms from 20 different countries to provide international evidence on the determinants of zero-leverage. They document that firms that are in countries with common law, a dividend relief tax system and high creditor protection are more likely to have conservative debt policies. This is because common law countries

provide better creditor protections than civil law countries. Hence, firms in common law countries may be able to access better equity financing, thereby having higher equity values (La Porta et al. 1998; 2002). Further, some empirical studies examine whether macroeconomic conditions play a role in determining firms' leverage conservatism policies. Dang (2013) shows that adverse macroeconomic conditions such as widened term structure of interest rates that may make it unconducive to borrow may induce firms to adopt a conservative policy. Bessler et al. (2013) report that high business risks may make firms to carry less leverage as there is likely to be a positive association between financial distress costs and asset volatility.

Although the earlier empirical studies produce some valuable explanations on why firms follow such a policy, however, the methods they used to classify their conservative firms have made it impossible for have in-depth understanding of the puzzling phenomenon of firms' conservative policy, as they ignored the fact that firms have an optimal leverage level that may reflect the costs and benefits of debt financing (Modigliani and Miller 1963). Firms may allow their actual leverage to deviate from the target, and firms may readjust their leverage level back towards the target level when it is suboptimal (Byoun 2008; Fisher et al. 1989; Leland 1994; Hovakimian et al 2004). Studies that do not consider the optimal leverage level in identifying conservative firms may thus provide limited information on why firms are conservative, for in the first place the firms are operating at a sub-optimal level. Thus, our study attempts to fill the gap that exists in the literature with regards to this area to explore why firms become financially conservative.

Following this, in the next subsection, we develop the main hypotheses that underpin our studies.

4.2.2: Development of testable hypotheses

4.2.2.1: The Financial constraints hypothesis

According to previous studies, debt-holders sometimes find it difficult to evaluate the quality and quantity of the assets that are in place in some firms and even the potential growth opportunities that they may have, because of information asymmetries. A firm that encounters such a situation may then be forced to ration its credit when in need of external finance to fund profitable projects (Stiglitz and Weiss 1981). It is argued that some firms may find it difficult to access debt markets in the presence of moral hazard because of lack of strong reputations

and history (Diamond 1991). Further, some firms may not be able to borrow at the market unless they have assets that could be used as collateral for their loans (Benmelech and Bergman 2009; Boot et al. 1991; Kiyotaki and Moore 1997; Tirole 2005). Acharya et al. (2013) find that firms that have higher beta experience costly credit lines. Sufi (2007) reports that a firm with low cash flow is more likely to be financially constrained because such firm may experience difficulty in obtaining lines credit. This is because the market may perceive that a firm with low cash-flow may have a high probability of defaulting in the repayment of its loans. In all, these empirical studies indicate that firms that are financially constrained in the debt markets may eschew debt by relying heavily on equity financing that is characterised by high informational dilution costs and cash holdings (Bolton and Feixas 2000; Byoun and Xu 2013).

To test the effect of financial constraints on leverage conservatism decisions we introduce three main variables to our study, namely, *firm size, tangibility ratio,* and *dividends*. Prior studies suggest that small firms are typically more likely to be constrained than large ones because of the high possibility of losing their market value due to poor performance, high possibility of facing cash-flow problems and less possibility of surviving adverse economic conditions because their values are sensitive to changes in the economy (Chan and Chen 1991; Friend and Lang 1988; Hadlock and Pierce 2010; Ozkan 1996). Also, it is argued that small firms may be more prone to moral hazard and selection problems because of their closely held ownerships (Nicos et al 1999). We compute *firm size* as the natural logarithm of total assets in the 2004 retail price index. Also, financially constrained firms may prefer to hoard cash by not distributing cash as dividend to shareholders (Almeida et al 2004). We measure *dividend pay-out* as the ratio of cash dividend to total assets.

Further, the financial constraints hypothesis argues that firms with more tangible assets may find it less costly to access the debt markets, and thus may have more debt because debt-holders are more willing to place high value on tangible assets than intangible ones because shareholders may be find it difficult to sell them during liquidation (Frank and Goyal 2009; Harford et al. 2009). Almeida and Campello (2007) show that firms with fewer tangible assets may either seek more expensive finance to fund new projects or reduce their investments, which may increase the marginal costs of total external financing because they have lower collateralised debt capacity. Both of these options that may be faced by firms that have fewer tangible assets can increase a firm's propensity to follow leverage conservatism policies. The

agency theory argues, in the presence of agency problem between managers and debt-holders, assets tangibility may increase a firm's cost of debt which may make a firm to be conservatively levered (Myers and Rajan 1998). The intuition behind the argument is that the managements of firms with more tangible assets may have the incentive to expropriate the wealth of debt-holders by selling and diverting the value of the assets to consume perquisites and pursue their own interests. We measure tangibility by the ratio of net property, plant and equipment to total assets, and predict a negative association. We classify a firm *as being conservative* if its actual leverage level is lower than both its optimal leverage and its industry average. A firm that satisfies the conditions is assigned the value of 1 and 0 otherwise. Thus, our financial constraints hypotheses are:

Hypothesis 4.1a: There is a negative relation between *firm size* and conservative financial decisions.

Hypothesis 4.1b: There is a negative relation between *tangibility* and conservative financial decisions.

Hypothesis 4.1c: There is a positive relation between *dividend pay-out* and conservative financial decisions.

4.2.2.2: The Underinvestment hypothesis

The conflict of interests between firm and debt-holders may lead to an under-investment problem. This is because the management of a firm that has risky debt outstanding may instead of allowing the payoffs of valuable projects to accrue to debt-holders pass up positive-NPV projects. Since the underinvestment problem would be greater for firms with high investment opportunities, Myers (1977) argues that firms that anticipate high growth opportunity sets may abstain from debt to reduce the cost of risky 'debt overhang' and ensure pay-offs from valuable projects accrue to only the shareholders. Also it is argued that firms that have valuable future growth opportunities may carry more debt to signal to the financial markets their confidence to generate sufficient cash flow to meet future obligations (Grossman and Hart 1982; Leland and Pyle 1977; Ross 1977). This is because, while firms tend to have better and high quality information about their present and future growth opportunity sets than the markets, the markets would rely on the leverage level to draw inferences about firms' operating decisions and values (Harris and Raviv 1990).

Further, it is argued that the market, because of the funds it provides to a firm, can actively monitor and influence the activities of the firm and use the mechanisms of liquidation and reorganisation to prevent the firm carrying out unprofitable projects to protect the interests of fund providers (Chava and Roberts 2008; Harris and Raviv 1990). Prior studies find that firms that have high-growth opportunities mitigate underinvestment problems by reducing their leverage level (Billet et al. 2007; Johnson 2003). For example, Dang (2011) finds that firms that reduce their leverage level are able to take on more growth options which in effect increases their investments. We test the validity of the underinvestment hypothesis by examining the effects of *growth opportunities* on a firm's propensity to follow a financial conservatism policy. Based on the explanations above, we hypothesise that;

Hypothesis 4.2: There is a positive relation between *growth opportunities* and financial conservatism.

It is not very possible to empirically observe a firm's growth opportunity as it includes all discretionary expenditure such as acquisitions of other firms, maintenance and replacement of existing assets, investments in goodwill, capacity expansion projects and introduction of new products (Gaver and Gaver 1993; Mason and Merton 1985). Nevertheless, it is argued in some previous studies that a firm's growth opportunity sets can be effectively measured by the market-to-book ratio (alternatively termed Tobin's Q), as it contains very important information about the book value of assets as well as the market of value of equity (Adam and Goyal 2008). The book value of assets that is in the computation of market-to-book may be used to proxy for the assets in place in a firm; while the market value of equity measures the present value of all the future cash-flows from both assets in place and future investment opportunities that may accrue to shareholders respectively (Adam and Goyal 2008; Chung and Charoenwong 1991). Thus, the market-to-book variable has been employed in several previous studies as proxy for the quality of management (Lang, et al. 1989; Smith and Watt 1992), firm performance (Arslan-Ayaydin et al. 2012; Florackis et al. 2009; Ozkan and Ozkan 2004), agency problems (Smith and Watt 1992), intangible assets (Smith and Watt 1992), and firm value (Allayannis et al. 2012; Carter et al. 2006; Fauver and Naranjo 2010). We measure *growth opportunities* as market-to-book ratio: computed as the ratio of total book value of assets minus book value of equity plus market value of equity to book value of assets. This calculation of market-to-book was also adopted by Allayannis et al. (2012); Arslan-Ayaydin et al. (2012); Florackis et al. (2009); and Ozkan and Ozkan (2004).

4.2.2.3: Corporate ownership structure

4.2.2.3.1: Managerial ownership

Managers do not always act in the interest of the firm. For example, in the presence of free cash flow, managers may not want to issue debt to ensure they have large funds available to them that could be used to increase their perquisites, thereby expropriating the shareholders. Thus, it is argued that firms that have free cash flow could force managers to issue more debt so as to commit managers to debt repayment thereby reducing wastage (Jensen 1986). Also, it is argued that managers are not always willing to divulge useful information to investors, particularly if such information may make them lose control of firms (Harris and Raviv 1990). Hence, in the presence of asymmetric information investors may allow managers to issue more debt so that they can use the debt to generate and evaluate information about the major operating decisions that managers made in their firms (Harris and Raviv 1990; Jensen 1989; Stulz 1990). On the other hand, it is revealed that managerial shareholdings align the interests of managers to those of shareholders to the extent that issuance of debt would make managers work harder, consume fewer perquisites and follow a better policy, because they are more likely to lose all if the firm encounters financial distress (Grossman and Hart 1982). In the presence of adverse selection costs that are associated with asymmetric information between managers and shareholders, managers may abstain from debt to preserve debt capacity for future financing needs (Byoun 2008). Similarly, it is argued that managers may follow a conservative leverage policy if they hold some fraction of their firms' shares, as managerial shareholding may induce little diversification of managerial wealth as managers may pursue a policy that would reduce firm-specific risk and protect their human capital (Agrawal and Nagarajan 1990; Berk et al 2010; Carlson and Lazrak 2010; Tufano 1996; Lewellen 2006; Milidonis and Stathopoulos 2014).

The suggestion of the entrenchment theory, therefore, is that managerial shareholdings may make managers eschew debt as they would prefer to reduce interest payments and increase the resources of the firms that are under their control for empire building and to consume personal perquisites (Chava and Purnanandam 2010; Stulz 1990). On the other hand, the argument of the alignment theory is that managerial shareholdings would make managers not pursue personal interest and they would adopt policies that would maximise wealth (Jensen

and Meckling 1976; Kiyotaki and Moore 1997; Levy 2001). If there are benefits to debt issuance, we would expect a negative relation between managerial shareholdings and leverage conservatism (the alignment hypothesis). If, on the other hand, managers do not want to lose control of their firms, we may find a positive relation between managerial shareholdings and leverage conservatism (the entrenchment hypothesis). Thus,

Hypothesis 4.3a: There is a positive relation between *insiders' ownership* and financial conservatism

Hypothesis 4.3b: There is a negative relation between *insiders' ownership* and financial conservatism

We use several measures of managerial shareholdings. First, we use the proxy board of directors' ownership (Board_Owners) as measured by the percentage of share ownerships of board of directors. Second, we measure the ownerships of executive (Exec_Owners) and non-executive directors (Non-Exec_Owners) as measured by the percentage of shareholdings by all executive directors and non-executive directors respectively. Finally, we measure the percentage of shares held by the chief executive and chief finance officers (*CEO_CFO*).

4.2.2.3.2: Institutional ownership

The separation of ownership and control creates incentives for managers to engage in policies that may be detrimental to the wealth of the firms, such as consuming perquisites at the expense of their shareholders (Jensen and Meckling 1976). Then, it is suggested that firms may use debt as a disciplining mechanism, as firms with excess cash-flows may issue more debts, thus reducing the resources that are available to the management, and compelling management to debt repayment (Jensen 1986). Further, the monitoring theory argues that institutional investors have greater incentives to actively, at low-cost, monitor, control and discipline the managements of a firm because of their market power and influence, as well as the sophisticated ability they have to gather and interpret information about a firm (Gillan and Starks 2003; Grier and Zychowicz 1994; McConnell and Servaes 1995; Jensen 1986). For instance, it is documented that institutional investors may exert their influence on the decisions made by the managements of firms in which they invest by making their preferences known through their shareholdings and individual trading, thus inducing firms to adjust corporate decisions to cater to their institutional investors (Hartzell and Starks, 2003; Tihanyi et al. 2003).

The proposition of the free-cash-flows and monitoring therefore is that firms that have a high concentration of institutional owners will not be financially conservative, as institutional investors would actively monitor and influence management to deter expropriations.

Furthermore, it is argued that in the presence of information asymmetry and agency conflicts between managers and outside investors, managements are not always willing to disseminate detailed information about the performance of their firms to outside investors, particularly when such information may weaken the control they have of the firms (Harris and Raviv 1990). In addition, it is suggested that debt may provide information to the market about the ability of a firm to meet its contractual payments to debt-holders (Harris and Raviv 1990). In view of this, it is argued that management may provide outside investors with signals about favourable expected performance and good governance by issuing more debt (Healy and Palepu 2001; Ross 1977; Zeckhauser and Pound 1990). Taking together the arguments on signalling with that of the monitoring hypothesis, it is suggested that firms with high institutional ownerships may not have need to use debt to signal information to the markets, because the firms may not have too high information asymmetries (Grier and Zychowicz 1994). Thus, there is a negative association between institutional ownerships and financial conservatism policy.

In addition, it is suggested that institutional ownerships may not always pursue the interests of all shareholders, particularly when the institutional ownerships are well entrenched, which may have undesirable effects on corporate decision making as well as the reputation of a firm at the debt markets (Grier and Zychowicz 1994). For instance, institutional owners may exert pressure on the management not to undertake some investments such as large M&As, even if such investments could enhance the value of the firms to ensure that existing governance dynamics, their shareholdings and their influence on the managements are not distorted (Andriosopoulos and Yang 2015). Initiating from the ideas of Friend and Lang (1988); Grier and Zychowicz (1994), if institutional investors can exert control on management to ensure that the dynamics of corporate governance is not distorted, the debt market may be wary of the firms with high presence of institutional investors and demand additional costs, which may increase the cost of debt for the firm. With high cost of debt, the firm may be compelled to adopt a financial conservative policy; thereby inducing a positive effect of institutional ownership on conservative policy.

Hypothesis 4.4a: There is a negative relation between *institutional ownership* and financial conservatism (Monitoring, disciplinary and signalling hypotheses).

Hypothesis 4.4b: There is a positive relation between *institutional ownership* and financial conservatism (Entrenchment and high cost of debt capital).

To investigate the effect of institutional ownership on financial conservative policy, we define institutional ownership as the percentage of a firm's outstanding shares held by all institutions.

4.2.2.4: Corporate hedging

In the presence of the agency problem of free cash flow, firms may issue debt to reduce the amount of free cash flow that is at the disposal of managers, thereby reducing managers' ability to invest in value-destroying projects or expropriate existing shareholders, as well as reduce managers' spending on perks (Jensen 1986). In the presence of agency problems relating to underinvestment, financial derivative instruments can be used to mitigate underinvestment problems as the use of derivatives makes internally generated funds available to firms to the extent that firms would not have to pass up valuable investment opportunities for lack of funds (Froot et al. 1993). In the presence of asymmetric information between firm and debt-holders, the debt-holders believe that any increase in firm value after debt has been issued will be distributed to shareholders. To diffuse such an impression, firms that frequently access the debt market may use derivatives to signal to debt-holders that funds will not be distributed to shareholders (Smith and Stulz 1985).

Further, it is argued that firms that use derivatives to mitigate expected financial distress would increase their debt capacity, because of a positive association between expected financial distress costs and volatilities (Stulz 1996; Smith and Stulz 1985). Thus, the association between financial distress and volatilities creates an incentive for firms that have more debt, high risk and/ or high probability of financial distress, to use derivatives because firms that hedge with derivatives would be able to lower their likelihood of violating existing financial covenants when probability of experiencing cash flow volatility is too high. Graham and Rogers (2002) provide the first empirical test on the effect of derivative usage on debt policies. They find that hedging with derivatives may lead to increased debt capacity as derivatives users may increase their debt level by 3%. Further, the financial flexibility hypothesis argues that firms that anticipate future valuable growth opportunities, in the presence of financial

market frictions, may increase their debt capacity by following a leverage conservative policy to ensure there are funds to finance valuable projects (see Marchica and Mura 2010). Also, Disatnik et al. (2014) argue that in the presence of financial distress, firms that use derivatives may have access to cost-effective external financing in place of internally generated funds. This is because derivatives usage would reduce the firms' dependence on internal funds, thereby allowing reliance on debts. Further, it is argued that firms that hedge their exposures are more likely to be conservatively levered because of convexity of the cost of capital (Amaya et al. 2015).

In contrast, some past studies indicate that leverage is counter-cyclical. Bessler et al. (2013) and Dang (2013) argue that firms may follow a conservative leverage policy when their business risks are high, particularly when there is macroeconomic uncertainty. Taken together, if firms that have high business risk use derivatives to reduce their exposure, to the extent that the business risk is reduced, they would have incentive to adopt a leverage conservative policy. Hence, we hypothesise that;

Hypothesis 4.5: There is a negative relation between *hedging* and financial conservatism.

To examine this hypothesis, we measure *corporate hedging* variable as 'binary variable' that takes the value of 1 if a firm hedges with foreign currency, interest rate and/or commodity derivatives in a given year and 0 otherwise.

4.3: Research Design

In this section, we discuss our sample.

4.3.1: Data

4.3.1.1: Sample construction

To perform our analysis, we draw our sample from the London Stock Exchange listed firms for the period 2000-2013. We hand-collect information for the ownership structure and derivatives usage from the Thomson One Banker website and the annual company reports, respectively. All accounting information utilised in our analysis is collected from the Datastream database.

Following previous studies we impose a number of data restrictions. First, we exclude from our sample firms that are in the financial and utility sectors. This is because firms in the financial sector have a significantly different capital structure from that of non-financial firms and firms in the utility sector have stringent regulations. Second, we exclude firm-year observations that have missing values. Then, we exclude firms that have fewer than five years observations to enable us to use the lag of our variables as instruments in the GMM estimator for leverage models (Arellano and Bond 1991). Lastly, following previous studies we trim all variables at both ends of the percentiles to eliminate potential effects of extreme values. This is necessary because outliers from an unusual large error and/or unusual value of a regressor may have substantial undesirable influence on the estimated coefficients of our explanatory variable, estimated variance of the explanatory variable, fitted values and/or the goodness of fit statistics (Belsley et al. 1980; Chatterjee and Hadi 1986). To identify the outliers that are in our dataset, we first plot histogram graphs and trim variables as mentioned above. Following the clean-up of our data, the final overall sample comprises 244 firms with 2,336 firm-year observations.

4.3.1.2: Definition of financial conservatism

This study adopts a definition of financial conservatism as used in previous studies such Lemmon et al. (2008) that concentrate on firm leverage policy only. In general, we define financial conservatism as a policy whereby firms adopt a leverage decision that allows them to have a low level of debt or no debt at all, and classify a firm *as being conservative* if its actual leverage level is lower than both its optimal leverage and its industry average. Focusing on only the leverage policy that firms follow enables us to have holistic and in-depth investigations of different levels of conservatism. The study classifies financial conservatism policies into four different types, starting from the not too extreme to the extreme level of leverage conservatism (see Table 4.1 for a summary of the different types of financial conservatism policies). First, we identify a leverage conservatism policy that is at the positive end of conservatisms: *the low-leverage policy*. This policy allows a firm to carry a leverage level that does not exceed the firm's optimal level and its industry average. We call a firm that follows this policy a *low-levered* (LL) firm. Firms are assigned the value of 1 if they follow the LL policy and 0 otherwise. Second, we identify the *nearly low-leverage policy* where firms have leverage level that is less than 5 per cent of both the optimal and industry average and

call the firms the *nearly low-levered* (NLL) firms. Firms are assigned the value of 1 if they follow the NLL policy and 0 otherwise. Third, moving to the negative end of conservatism is *nearly zero-leverage policy*. The *nearly zero-leverage policy* (NZL) allows a firm to carry leverage that is lower than 1 per cent of both the optimal leverage level that is expected of a firm according to existing theory as well as the industry average in which the firm operates. We give the firms that follow the NZL policy the value of 1 and 0 otherwise. Lastly, we identify an extreme conservative policy, *zero-leverage policy* (ZL). The ZL firms are those firms that carry no leverage in a given year. Firms are assigned the value of 1 if they follow a ZL policy and 0 otherwise. These different classifications of leverage conservatism policies allow the study to investigate the motives behind each policy individually and holistically.

Table 4:1: Types of financial conservative policies and their definition
This table reports different types of financial conservative policies that are identify in this study as well as their definition.

	Types of financial conservatism policies		Definition
1	Low-levered	LL	This policy allows a firm to carry a leverage level that does not exceed the firm's optimal level and its industry average.
2	Nearly low-levered	NLL	Policy allows firms have leverage level that is less than 5 per cent of both the optimal and industry average
3	Nearly zero-leverage	NZL	Policy allows a firm to carry leverage that is lower than 1 per cent of both the optimal leverage level that is expected of a firm according to existing theory as well as the industry average in which the firm operates.
4	Zero-leverage	ZL	No debt

4.3.2: Methodology

In this section we describe the methods used in carrying out all the regressions in this empirical chapter as well as the econometrics issues faced and how those issues are addressed.

We start the empirical chapter by estimating a leverage model to help us identify whether a firm follows a leverage conservative policy or not, focusing on the optimal leverage level of the firm. Following past studies, we define a firm as being conservative if its leverage ratio is lower than that predicted by any of the prevailing capital structure theories or in the extreme case if the firm does not carry any debt at all (Byoun 2013; Dang 2013; Frank and Goyal 2005; Graham 2000; Miller 1977; Strebulaev and Yang 2013). Then, we argue that to effectively make a conclusion that a firm is conservatively levered, it is necessary to know whether the

firm's actual leverage level is optimal or not. This is because unless we assume that the actual leverage that is being carried by all firms is optimal, then there would be no need to be concerned with suboptimal leverage levels. This is because, if the actual leverage of a conservative firm is suboptimal, there would be no need to examine why the firm is conservative. Based on this, we define a firm as low-levered if it carries leverage level that is lower than the optimal level. In addition, we apply another stringent requirement that the leverage level must also be below the average for the industry in which a firm operates. This additional measure helps us to take into consideration the possibility that some unprofitable firms might have had a higher leverage level than the predicted optimal level although they may be likely to have lower leverage than other firms in the same industry (Ozkan 2001).

In equation 1, we specify a leverage model. The main essence of our leverage model is not to contribute in any way to the on-going argument on the leverage model, but to use the key variables that existing theories and previous empirical studies have suggested to be correlated with leverage to predict the optimal leverage level for each firm in a given year. For example, we capture the trade-off theory by including the previous year's leverage level (*lagged leverage* variable) to proxy for mean reversion and the *tangibility ratio* (TANG), which is measured as the ratio of net property, plant and equipment to total assets. Furthermore, we capture the pecking order theory by incorporating the *profitability* variable (PROFIT), which is measured as the ratio of EBIT to total assets. The theory suggests that profitable firms would prefer to first expend their less risky internal resources (e.g., retained earnings) to finance investment before considering risky debt (Myers 1984; Myers and Majluf 1984). Also, we measure *growth opportunities* as market-to-book, and measure it as a ratio of total assets less the book value of equity plus the market value of equity to the book value of assets, to capture the likelihood that firms with high growth opportunities may use less debt to mitigate the conflict of interests that exists between debt-holders and shareholders (Myers 1977). Finally, we incorporate *firm size* (SIZE) and measure it as the natural logarithm of total assets in 2004 retail price index (RPI) to account for size effects; for example, larger firms may find it easy to access the financial markets and obtain loans at more favourable interest rates (Ferri and Jones 1979). Hence, our panel leverage model[19] is thus;

[19] This type of leverage model has also been estimated in studies conducted by Dang et al (2012); Rajan and Zingales (1995); and Ozkan (2001).

$$LEV_{it} = \alpha_0 + \beta_1 LEV_{it-1} + \beta_2 PROFIT_{it} + \beta_3 SIZE_{it} + \beta_4 GROWTH_{it} + \beta_5 TANG_{it} + \nu_{it} + \varepsilon_{it}$$

(Equation 4.1)

where α is the constant term and $\beta_{1-----5}$ are the estimated regressors. The way we estimate our model creates some econometric concerns. The first concern of the model is the potential *endogeneity problem* relating to *simultaneity bias*. This is because while our model is developed to observe the effect of market-to-book on leverage, there is also the possibility that leverage may have an impact on the market-to-book ratio, if there is a negative relation between leverage and the market value of a firm. On the other hand, if there is a positive relation between leverage and financial risk, an increase in firm's leverage level may be observed as a negative relation between leverage and market to book ratio, particularly in the presence of macroeconomic shocks for example (Ozkan 2001). Another important concern of the study is finding a suitable estimator that would accommodate our dynamic and partial model. Previous empirical studies had used the standard estimators such as the Fama-MacBeth (1973), fixed effects and the pooled Ordinary Least Square (OLS) estimators (Byoun 2008; Fama and French 2002; Frank and Goyal 2003; Shyam-Sunder and Myers 1999). However, it is argued that the standard estimators may produce biased results in dynamic panel data models, as they may assume that a lagged dependent variable is correlated with the unobserved fixed effects and thus, be biased upwards or downwards (Baltagi 2008; Ozkan 2001; Wintoki et al. 2012). Also, OLS estimates may be biased if there are unobservable firm fixed-effects and if the covariances between explanatory variables and firm-effects are non-zero (Hsiao 1985). Nevertheless, the generalised method of moments (GMM) is a semi-parametric estimator that would be efficient in the presence of a partial and dynamic model. This is because the GMM estimator can choose the value of the unknown parameter vector in such a way that estimated moments in the data would be equal to their theoretical counterparts (Ghysels et al. 2002; Kennedy 2009).

To address endogeneity and other econometric issues, we employ the GMM estimator and treat all variables as endogenous[20]. We test the validity of our leverage by conducting the Sargan test of over-identification restrictions and serial correlation tests. The results of the tests are shown in Appendix II. Further, we use the fitted values obtained from the regression to compute the optimal leverage level for each firm in each year (LEV^P). A firm that satisfies

[20] Several other papers on capital structure also deal with such econometric issues by utilising the GMM estimator. Such papers include Antoniou et al. (2008); Dang et al. (2012; 2014); and Ozkan (2001) to mention a few.

the following conditions is classified as being conservative and takes the value of 1. The first condition is that a firm's actual leverage is less than the predicted leverage and the second condition is that a firm's actual leverage is less than its industry average.

Having constructed the dependent variable that will be used in the main regressions of the study, we proceed to our main analysis. We perform both univariate and multivariate regression analyses. First, we estimate several pooled logistic regression models to examine the factors that influence a firm to follow leverage conservatism. The basic logistic model is as follow:

$$\Pr(CON\_LEV = 1) = \frac{1}{1+e^{\alpha+x\beta}} \qquad \text{(Equation 4.2)}$$

where *CON_LEV*[21] is a binary variable that takes the value of 1 if the two conditions for conservatism hold (explained above) and 0 otherwise, α is a constant, β is the vector of coefficients and **X** is a matrix of the independent variables, which include: *derivative usage* (DER_USE), *market-to-book* (Growth), *tangibility ratio* (tangibility), *profitability* (profit) *firm size* (SIZE), *capital expenditure* (CAPX), *dividend pay-out* (dividend_payout), *Board of Directors ownership* (Board_Own) and *institutional ownership* (TOT_Ins_Own). We include year and industry dummies to control for the effects of different year and industry respectively. We perform the diagnostic test to assess the predictive accuracy of our models by testing the hypothesis that our models are correctly specified, using the area under the ROC curve (AUROC). The AUROC statistics of our models are presented in the tables.

Second, we perform sensitivity analysis to explore the change in probability that a firm would be conservatively levered following an infinitesimal change (from a 5 per cent up to 100 per cent change) in our continuous variables or a change in a dummy variable from zero to one, holding other variables constant at their respective means (Bartus 2005). The standard errors of all regression analyses are corrected for heteroscedasticity and clustered at the firm-level (Petersen 2009).

We present, in the next subsection, some preliminary results vis-a-vis the statistics of all variables as well as results of some hypotheses that were tested in univariate analysis.

[21] We use CON_LEV in this context as a broad definition for our different types of leverage conservative (Low-leverage, nearly low-leverage, nearly zero-leverage and zero-leverage) policies.

4.4: Results

This section reports the results of all the tests that were carried out in this study.

4.4.1: Descriptive statistics

Table 4.2 reports the whole sample descriptive statistics for the variables that were used in our analyses. The firm size of our sample ranges from 11.99 to 24.68 with a mean of 18.27. This number indicates that our sample represents both small and large firms. On average, the firms have profitability of 1.75 per cent and growth opportunity of 2.23. We find that about 4.4 per cent of our sample assets are investments in capital projects and about 22 per cent in tangible assets. Furthermore, almost 63 per cent of our sample hedges with derivatives and about 3 per cent of our sample have non-debt-tax shields in the years under review. Also, ownerships of the board of directors as well as those of institutional investors are, on average, 11.64 per cent and 44.23 per cent respectively. In summary, our sample is well dispersed in that the characteristics show that there are small and large firms, good numbers of derivatives users and non-users, as well as diverse ownerships. In the next sub-section, we show that the low-leverage policy of our sample is not a transitory or short-term behaviour.

Table 4:2: Descriptive statistics: whole sample
Descriptive statistics are estimated on the pooled dataset. This table presents standard descriptive statistics for variables with sample periods 2001-2013 for all variables except Deriv_Usage that has sample periods 2005-2011. Definitions of variables are presented in Appendix 2.3.

VARIABLES	Obs	Mean	Std Dev	Min	Max
Panel A: Firm characteristics					
Leverage	2,336	0.1593	0.1759	0.0000	1.0000
Capex	2,336	0.0442	0.0612	0.0000	0.8130
Cash	2,336	0.1629	0.1906	0.0000	0.9989
Dividend_dummy	2,336	0.6618	0.4732	0.0000	1.0000
Dividend_payout	2,336	0.0242	0.1128	0.0000	5.0112
Growth	2,336	2.2303	1.3319	0.9994	11.2934
Non_debt_tax_shield	2,336	0.0291	0.0282	0.0000	0.2332
Profitability	2,336	0.0175	0.2425	-2.1832	0.4160
Size	2,336	18.2691	2.2018	11.9924	24.6780
Tangibility	2,336	0.2204	0.2248	0.0000	0.9548
Panel B: Ownership structure					
Board_Owners	2,336	0.1164	0.1806	0.0000	0.9883
CEO_CFO	2,336	0.0528	0.1168	0.0000	0.8132
Exec_Owners	2,336	0.0644	0.1301	0.0000	0.8213
Grey_Owners	2,336	0.0378	0.0539	0.0000	0.5690
Indep_Owners	2,336	0.4041	0.2745	0.0000	0.9639
Non_Exec_Owners	2,336	0.0520	0.1256	0.0000	0.9883
Other_Exec_Owners	2,336	0.0116	0.0456	0.0000	0.6064
TOT_Inst_Owners	2,336	0.4423	0.2935	0.0000	0.9998
Panel C: Hedging policy					
Deriv_Usage	1,359	0.6262	0.4840	0.0000	1.0000
Number of firms	244	244	244	244	244

4.4.2: Univariate analysis

In this sub-section, we conduct a series of preliminary tests. First, we show the distribution of leverage conservative firms by year. Second, we empirically examine whether the leverage conservative policies of our sample are persistent and finally, we compare the characteristics of our leverage conservative firms with those of non-conservative firms.

4.4.2.1: Frequency of leverage conservatism policies

Table 4.3 presents the distribution of leverage conservative firms by year. The results show that, over the sample periods 2001-2013, about 38.83 per cent of our firm-year observations have a low-leverage policy, 32.23 per cent have a nearly low-leverage policy, 29.49 per cent follow a nearly low-leverage policy and 19.58 per cent have no outstanding debt. The sample periods were separated into three vis-a-vis pre-crisis (2001-2007), during the financial crisis (2008-2009) and after the financial crisis (2010-2013) to examine the variation in the proportion of leverage conservative firms over the different macroeconomic periods. This enables us to use real-life macroeconomic situations to provide real findings. We find that leverage conservatism policies are pro-cyclical as more firms tend to use less debt during an expansionary period (in our case, the pre-financial crisis period) while few firms use debt during the financial crisis.

Table 4:3: Frequency of financially conservative firms
This table summarises the distribution of leverage conservative firms by time. It shows the number and percentage of firms that have a LL status (i.e., firms that have that leverage level that is less than predicted and industry average), NLL status (i.e., firms are firms that have leverage that is less than or equal to 5% both predicted and industry average), NZL status (i.e., firms that have leverage less than or equal to 1% both predicted and industry average) and a ZL status (i.e., firms that have no debt debt) in a given year.

Distribution of leverage conservative firms by time												
Periods	All sample	LL firms	%	All sample	NLL firms	%	All sample	NZL firms	%	All sample	ZL firms	%
2001-2007	1,114	452	40.57	1,114	381	34.20	1,114	346	31.06	1,110	224	20.10
2008-2009	390	128	32.82	390	107	27.44	390	98	25.13	388	60	15.46
2010-2013	832	327	39.30	832	265	31.85	832	245	29.45	831	172	20.70
Number of observations	**2,336**	**907**	**38.83**	**2,336**	**753**	**32.23**	**2,336**	**689**	**29.49**	**2,329**	**456**	**19.58**

Looking at the LL firms' column in Table 4.3, the proportion of firms that have a low-leverage policy in 2001-2007 is 40.57 per cent. This falls sharply to about 32.82 per cent during the financial crisis in 2008-2009 before rising to 39.30 per cent over the period 2010-2013. We observe similar trends for the other types of leverage conservatism as the percentages of nearly low-leverage, nearly zero-leverage and zero-leverage firms also fall during the period 2007-2008. A potential explanation for this trend is that firms use less debt during the expansionary period to increase their borrowing capacities during the financial crisis, thereby ensuring they have enough funds to carry out profitable projects when there is a credit crunch. This finding is consistent with the financial flexibility view. An alternative view is that firms may have been drawing from their internally generated funds to finance projects in expansionary periods (explaining the lower use of debt at the time) because they are more certain about assets in place; hence, most firms are leverage conservative during an expansionary period. Firms may, however, choose to strategically safeguard cash-flow shocks as uncertainty increases by not using internal funds to finance projects and relying more on debt during a financial crisis (Acharya et al. 2007; Baum et al. 2008; Gamba and Triantis 2008; Lins et al 2010).

4.4.2.2: Characteristics of leverage conservative firms

In Table 4.4, we compare the characteristics of low-levered firms with those of high-levered firms. The table shows the mean, standard deviation, minimum and maximum values of the variables as well as the number of observations. We find that the two sub-groups of firms are different in several ways. First, we find that the low-levered firms hold less debt than the high-levered firms (2.1% versus 24.7%) during the period 2001-2013. This is not surprising as the low-levered firms are expected to follow a conservative leverage policy. Second, we find that the low-levered firms in our sample are small and hedge less with derivative compared to the levered firms. These findings are in line with the financing constraint proposition as small firms and non-hedgers are most likely to find it difficult to access financial markets (Froot et al. 1993; Hadlock and Pierce 2010; Smith and Stulz 1985). Third, the low-levered firms have more growth opportunities and less capital investment spending compared to the high-levered firms. The findings are in line with the underinvestment hypothesis as firms that have high growth options would abstain from debt (Myers 1997). Further, we find that the low-levered firms have lower ownerships of institutional investors than the levered firms (40.5% vs. 46.6%).

In addition, the low-levered firms have considerably higher executive directors' ownerships and distribute more dividends to their shareholders than the high-levered firms. Moreover, we find that the low-levered firms carry fewer tangible assets than the levered firms, which lends support to the trade-off theory. In sum, our results that low-levered firms have low tangible assets, are small and have lower institutional ownership may be indications that these firms have substantial agency problems and may have higher transaction costs, which may limit their chance of accessing debt markets. On the other hand, managerial shareholdings and dividend pay-out may be used to signal their growth opportunities and strong corporate governance to the markets. Since our study attempts to investigate why firms are conservative, we also look at the characteristics of our other classes of conservative firms, i.e., nearly low-levered, nearly zero-levered and zero-levered firms. The tests enable us to understand whether the firm characteristics of the different leverage conservatism policies are similar.

In Table 4.5, we present the results of our investigations. Panel A, Table 4.5 shows the results of the analysis that compares the characteristics of the NLL firms with those of high-levered (HL) firms. The NLL firms are smaller than the high levered firms, are less profitable and have fewer tangible assets. Also, the NLL firms have high growth opportunities, hold large cash balances and use fewer financial derivative instruments. Further, the NLL firms have low institutional investors shareholdings but large executive directors' shareholdings, particularly, the chief executive and chief finance officer's.

Panel B (Panel C) shows a comparison of NZL (ZL) firm characteristics with those of the HL (levered) firms. On all fronts, the characteristics that make the NZL (ZL) firms different from the HL (levered) firms appear similar to those that make the two previously examined categories of leverage conservative firms different from the HL firms. However, we find that our four classes of leverage conservative firms are different from one another. First, we find that the LL firms are the largest among the leverage conservative firms. Second the LL firms have fewer growth opportunities and less capital expenditure. Also, the LL firms tend to have less cash dividend distribution, hold smaller cash balances and use more derivatives than the NLL, NZL and ZL firms.

Table 4:4: Characteristics of LL firms

This table shows the characteristics of low-leverage firms and compares the mean firm characteristics of low-leverage firms (LL) with those of high-leverage firms (HL). A firm is classified as low-levered if its actual leverage level is lower than the optimal and industry average leverage. The table shows the number of observations, mean, standard deviation, minimum and maximum values for each sub-group as well as the difference in means. All variable definitions are reported in Appendix 2.3. The associated significance levels are obtained from *t-test* with equal variances. ***, ** and * denote that the differences are significant at the 1%, 5% and 10% levels respectively.

	LL firms					HL firms					*t-statistics* Difference in means
Variables	N	Mean	Std Dev	Min	Max	N	Mean	Std Dev	Min	Max	
Leverage	907	0.0207	0.0333	0.0000	0.1341	1,429	0.2472	0.1731	0.0000	1.0000	**-0.2265*** **
Profitability	907	-0.0139	0.2845	-2.0242	0.4021	1,429	0.0374	0.2093	-2.1832	0.4160	**-0.0513*** **
Size	907	17.5311	1.8954	12.4496	23.8527	1,429	18.7380	2.2544	11.9924	24.6780	**-1.2064*** **
Growth	907	2.4098	1.2865	0.9994	11.2934	1,429	2.1164	1.3480	1.0000	10.9007	**0.2934*** **
Tangibility	907	0.1575	0.1884	0.0000	0.9472	1,429	0.2603	0.2367	0.0000	0.9548	**-0.1028*** **
Capex	907	0.0422	0.0641	0.0000	0.5135	1,429	0.0454	0.0594	0.0000	0.8130	-0.0032
Non_debt_tax_shield	907	0.0261	0.0255	0.0000	0.2181	1,429	0.0311	0.0297	0.0000	0.2332	**-0.0050*** **
Dividend_payout	907	0.0244	0.0635	0.0000	1.6293	1,429	0.0241	0.1351	0.0000	5.0112	0.0003
Dividend_dummy	907	0.5843	0.4931	0.0000	1.0000	1,429	0.7110	0.4535	0.0000	1.0000	**-0.1267*** **
Cash	907	0.2542	0.2303	0.0000	0.9989	1,429	0.1049	0.1307	0.0000	0.9943	**0.1493*** **
Board_Owners	907	0.1167	0.1716	0.0000	0.9009	1,429	0.1162	0.1862	0.0000	0.9883	0.0005
Exec_Owners	907	0.0695	0.1296	0.0000	0.7133	1,429	0.0612	0.1304	0.0000	0.8213	0.0083
Non_Exec_Owners	907	0.0473	0.1069	0.0000	0.8550	1,429	0.0551	0.1362	0.0000	0.9883	-0.0078
CEO_CFO	907	0.0557	0.1179	0.0000	0.7078	1,429	0.0511	0.1160	0.0000	0.8132	0.0046
Other_Exec_Owners	907	0.0138	0.0505	0.0000	0.5984	1,429	0.0102	0.0421	0.0000	0.6064	**0.0036***
TOT_Ins_Owners	907	0.4049	0.2867	0.0000	0.9998	1,429	0.4661	0.2954	0.0000	0.9979	**-0.0612*** **
Indep_Owners	907	0.3734	0.2716	0.0000	0.9639	1,429	0.4242	0.2747	0.0000	0.9636	**-0.0508*** **
Grey_Owners	907	0.0304	0.0488	0.0000	0.5516	1,429	0.0424	0.0563	0.0000	0.5690	**-0.0120*** **
Industry_average	907	0.0822	0.0486	0.0032	0.1343	1,429	0.0719	0.0472	0.0032	0.1343	**0.0103*** **
Deriv_Usage	494	0.4615	0.4990	0.0000	1.0000	865	0.7202	0.4491	0.0000	1.0000	**-0.2587*** **

Further, we find that the NZL firms have more tangible assets and distribute more cash dividends. On the other hand, we find first, that the ZL firms are the smallest among the classes of leverage conservative firms, which partly explains why they avoid debt as very small firms are more likely to be credit constrained (Hadlock and Pierce 2010). Second, the ZL firms have considerably more valuable growth opportunities than the LL, NLL and NZL firms. Third, the ZL firms hold larger cash balances and use less derivatives compared to the LL, NLL and the NZL firms. Interestingly, the board of directors hold larger shares in the ZL firms than they do in the LL, NLL and NZL firms. This further corroborates our earlier assumption that insiders may be using their shareholdings for signalling purposes. Following our preliminary findings in this section, we proceed to the next sections to examine the specific factors that make firms have conservative policies, by carrying out multivariate tests.

Table 4:5: Characteristics of the NLL, NZL, and ZL firms

This table compares the mean of the characteristics of leverage conservative firms with those of non-conservative (levered and high leverage (HL)) firms. It shows the number of observations, mean for variables in each sub-groups as well as the corresponding difference in means. The associated significance levels are obtained from *t-test* with equal variances. ***, ** and * denote that the differences are significant at the 1%, 5% and 10% levels respectively. The NLL (nearly low-leverage) status are firms that have leverage that is less than or equal to 5% of both predicted and industry average. The NZL (nearly zero-leverage) status are those firms that have less than or equal to 1% of both predicted and industry average in a given year and the ZL (zero-leverage) status are those firms that have no leverage in a given year. Variable definitions are reported in Appendix 2.3.

Variables	Panel A			Panel B			Panel C		
	NLL firms	HL firms	Difference in means	NZL firms	HL firms	Difference in means	ZL firms	Levered firms	Difference in means
	(1)	(2)	(1) vs. (2)	(3)	(4)	(3) vs. (4)	(5)	(6)	(5) vs. (6)
Leverage	0.0642	0.2045	**-0.1403*** **	0.0698	0.1967	**-0.1269*** **	0.0000	0.1940	**-0.1940*** **
Profitability	-0.0452	0.0473	**-0.0925*** **	-0.0456	0.0439	**-0.0895*** **	-0.0857	0.0434	**-0.1291*** **
Size	17.3506	18.7060	**-1.3554*** **	17.3261	18.6636	**-1.3375*** **	16.6604	18.6592	**-1.9988*** **
Growth	2.6845	2.0143	**0.6702*** **	2.6707	2.0461	**0.6246*** **	2.9702	2.0432	**0.9270*** **
Tangibility	0.1700	0.2443	**-0.0743*** **	0.1747	0.2395	**-0.0648*** **	0.1398	0.2400	**-0.1002*** **
capex	0.0459	0.0434	0.0025	0.0470	0.0430	0.0040	0.0439	0.0442	-0.0003
Non_debt_tax_shield	0.0281	0.0296	-0.0015	0.0284	0.0295	-0.0011	0.0256	0.0300	**-0.0044*** **
Dividend_payout	0.0297	0.0215	0.0082	0.0299	0.0218	0.0081	0.0235	0.0217	0.0018
Dividend_dummy	0.4859	0.7454	**-0.2595*** **	0.4790	0.7383	**-0.2593*** **	0.4211	0.7218	**-0.3007*** **
Cash	0.2907	0.1021	**0.1886*** **	0.2920	0.1088	**0.1832*** **	0.3660	0.1135	**0.2525*** **
Board_Owners	0.1214	0.1141	0.0073	0.1271	0.1120	**0.0151* **	0.1522	0.1077	**0.0445*** **
Exec_Owners	0.0733	0.0601	**0.0132** **	0.0767	0.0593	**0.0174*** **	0.0925	0.0574	**0.0351*** **
Non_Exec_Owners	0.0480	0.0539	-0.0059	0.0504	0.0527	-0.0023	0.0597	0.0503	0.0094
CEO_CFO	0.0626	0.0482	**0.0144*** **	0.0656	0.0475	**0.0181*** **	0.0778	0.0465	**0.0313*** **
Other_Exec_Owners	0.0107	0.0120	-0.0013	0.0110	0.0118	-0.0008	0.0147	0.0109	0.0038
TOT_Ins_Owners	0.3929	0.4659	**-0.0730*** **	0.3816	0.4677	**-0.0861*** **	0.3316	0.4698	**-0.1382*** **
Indep_Owners	0.3581	0.4259	**-0.0678*** **	0.3476	0.4277	**-0.0801*** **	0.3043	0.4289	**-0.1246*** **
Grey_Owners	0.0332	0.0399	**-0.0067*** **	0.0322	0.0401	**-0.0079*** **	0.0259	0.0406	**-0.0147*** **
Industry_average	0.0729	0.0773	**-0.0044** **	0.0714	0.0778	**-0.0064*** **	0.0665	0.0783	**-0.0118*** **
Hedging_decision	0.4348	0.7101	**-0.2753*** **	0.4349	0.7015	**-0.2666*** **	0.3080	0.6980	**-0.3900*** **
Number of observation	753	1,583		689	1,647		456	1,873	

4.4.3: Multivariate analysis

4.4.3.1: Leverage model

To predict the optimal leverage of each firm in our sample, we work in several stages. In the first stage, we estimate leverage models by controlling for five different variables as suggested by the main theories and prior empirical studies, using GMM estimators. The results of the estimations are reported in Appendix 4.1. Column 1 of Appendix 4.1 reports the results for the Difference GMM (DIFF-GMM) estimator using the Stata module xtabond2 (Roodman 2009), and Column 2 of the Appendix presents the results of the SYS-GMM estimator using the Stata module xtdpd (Blundell-Bond 1998). It is argued in econometrics literature that in the presence of short, dynamic panel data models, the SYS-GMM estimator has the ability to improve the consistency and efficiency of the DIFF-GMM estimator (Blundell and Bond 1998). This is because the SYS-GMM estimator does not only apply the first-differencing transformation to equation in dynamic panel data models, it also utilises additional moment conditions in level equations as instruments under the orthogonality conditions between the instruments and error terms (Blundell and Bond 1998). Thus, we utilise the estimated coefficients from the SYS-GMM estimator to predict the annual optimal leverage level for each firm.

The dependent variable is leverage, which is defined as the ratio of total debt to total assets. The two estimators reveal that the coefficient on the lagged leverage is positive and statistically significant at the 1 percent level however, their economic significance is different. In column 1, the adjustment coefficient λ (given by 1- γ_0) is 0.22, which indicates that firms close less than a quarter of their deviation from target leverage level within a year. Further, the signs on most of the variables are in line with theoretical explanations and findings of most prior studies and are statistically significant at different levels, except in growth opportunities. We expected that the coefficient on growth would be negative as high-growth firms are expected to use lower debt to mitigate conflict of interests between debt-holders and shareholders (Myers 1977). In column 2, we find a relatively high adjustment coefficient of about 0.58. This is very similar to those reported by previous studies for UK firms (Dang et al. 2012; Ozkan 2001). It suggests that UK firms adjust quickly to their target leverage level

by closing more than a half of their deviation within a year. Further, the coefficients of all the variables are very much in line with theories and the findings of previous studies. For brevity, we do not provide separate explanation for the individual coefficients as they are consistent with previous studies such as Ozkan (2001); and Rajan and Zingales (1995).

In the second stage, we utilise the coefficients from the leverage model to compute fitted values: the annual optimal leverage levels for each firm. Then, we proceed to the third stage, which compares the optimal leverage with the actual leverage, to identify firms with negative deviation from the optimal level. In the next section, we carry out several logistic regressions to investigate the factors that make firms avoid debt by using several definitions of financial conservatism policies.

4.4.3.2: Logistic regression analysis of a firm's decision to be leverage conservative

4.4.3.2.1: Results for a firm's propensity to follow a low-leverage policy

Table 4.6 reports the results from our pooled logistic regression analysis of a firm's propensity to follow low-leverage policy, in which our dependent variable takes the value of one if firm-year observation is LL, for period over 2001-2013. We present the result of our basic model specification in model 1, and three alternative specifications in models 2 - 4. In model 2, we include the ownership structure variables to examine the roles played by the board of directors and institutional ownerships. In model 3, we replace the board of directors' ownership with executive and non-executive ownerships. In model 4, the executive ownership variable is replaced with the chief executive and chief finance officers' ownership (CEO_CFO) while institutional investors' ownership is split into independent and grey ownerships. The CEO_CFO variable is used to examine how the share-ownerships of the key officers affect the decision of their firms to follow low-leverage policy. Also, we use the independent and grey institutional ownership to examine how the monitoring role of the institutional ownerships based on business relations affects firms' decision to have low leverage. In all models, we account for the effects of previous year low-leverage policy, industry and year differences by including their proxies.

The regressions in models 1 - 4 are statistically significant, with Pseudo R-squared that ranges from 0.4012 to 0.4036. We report the marginal effects of each variables association to the dependent variable. As shown in the table, the previous year's low-leverage decision is economically and statistically significant at 1 the per cent level in models 1 - 4. The prior year's LL policy coefficient ranges from 39.39 to 39.77. This provides evidence that the low-leverage policy of our sample is not transitory but persistent over time. Also, we find that the coefficient on firm size is negative and statistically significant in models 1 - 4. Specifically, a one per cent decrease in firm size (Size) is associated with a statistically significant increase of between 2.15 and 2.55 percent in the likelihood that a firm has low leverage. This is consistent with the financing constraints argument that a small firm is more likely to be low-levered as it may have limited access to debt markets. Further, in the models, we find that firms that have limited tangible assets have the likelihood to have low leverage. A one per cent decrease in tangibility is associated with about 16.76 and 17 per cent increase in propensity to adopt a low-leverage policy. A potential explanation is that LL firms may find it difficult to obtain loans at the market because they have limited tangible assets that could be used as collateral (Frank and Goyal 2009; Rajan and Zingales 1995). Alternatively, the LL firms may abstain from debt if they have higher tangible assets that they could sell to finance valuable projects (Strebulaev and Yang 2013).

Further, with regard to the underinvestment explanation for low-leverage policy, we do not find evidence that an underinvestment problem contributes to firms' propensity to have low leverage. Growth opportunities have statistically significant and negative association with a firm's propensity to have low leverage. A one per cent increase in growth yields a statistically significant increase of 2.00 and 2.13 per cent in the probability that a firm has low leverage. This is inconsistent with Myers' (1977) argument on underinvestment, that firms that have high growth opportunities would avoid debt. Also, we find evidence in models 1 - 4 that profitable firms have the likelihood to abstain from debt because of their reliance on internal financing more than external. The coefficient on profitability is negative; however, it is statistically insignificant. We find that a one per cent increase in profitability yields a statistically significant increase of 5.2 and 6.5 per cent in the probability that a firm has low leverage. This is in line with the pecking order theory and suggests that profitable firms may use less debt to avoid transferring wealth to debt-holders.

Turning our attention to the ownership variables, we find that the coefficient on insiders' ownership variables, i.e., the board of directors', executive, particularly the chief executive and chief finance officer and non-executive ownerships are generally negative. Although the coefficients are economically and statistically insignificant, they suggest some important implications about the associations between insiders' ownership and a firm's propensity to have low leverage. First, the results could mean that high insiders' ownership leads to lower cost of debt. Thus, such a firm has the incentive to have more debt. Second, the board of directors, particularly the chief executive and chief finance officers, could voluntarily take on more debt to signal to the market that the firm is profitable and has strong corporate governance. Finally, in the presence of the agency problem between shareholders and managers, shareholders could force their managers to increase debt if there are concerns about managerial shareholdings.

In terms of the institutional investors' ownership variables, that is, the independent and grey institutional owners, there is insignificant evidence that the type of business relation that institutional investors have with a firm may determine whether the firm would be low levered or not. Specifically, we find that institutional investors that do not have business dealings with a firm (independent institutional owners) may actively influence managers' activities to ensure that they follow low leverage policy. In the case of grey institutional investors, we find significant but weak evidence that the presence of grey institutional investors (including banks and other financial institutions) may make borrowing easier for firms to the extent that the cost of financing is reduced which make a firm would take on more debt. Taking the results on the independent ownerships and dividend pay-out together, independent investors may prefer a low leverage policy to protect their investment by ensuring that wealth is not transferred or redistributed to debt-holders.

Table 4:6: Pooled Logistic regressions of the determinants of LL policy

This table presents the results of the marginal effects from the logistic regressions of firms with low-leverage (LL) decisions with sample period, 2001-2013. The dependent variable is a dummy variable that takes the value of one if a firm is LL and 0 otherwise. A firm is classified as low-levered (LL) if its leverage is less than both the optimal leverage and industry average. Model 1 is the base model. In model 2, we examine the effect of the broad measure of ownership structure on LL policy. In model 3 replace the measure of board of directors' shareholding with the measure of executive directors' and non-directors' share-ownerships. In model 4 we replace executive directors' shareholdings with chief executive and chief finance officers' shareholding to examine the effect of chief executive and chief finance officers' shareholding on LL policy. Also, in model 4 we replace total institutional investors shareholdings with the measures of independent and grey investors' shareholdings to examine the type of institutional investors that affect LL policy. The signs ***, **, and * denote statistically significant coefficients at the 1%, 5% and 10% levels respectively. In parentheses are standard errors that are corrected for heteroscedasticity and clustered at the firm-level. The definitions of variables are presented in Appendix 2.3.

Variables	(1)	(2)	(3)	(4)
Previous LL decision	**0.3977*** **	**0.3951*** **	**0.3950*** **	**0.3939*** **
	(0.0132)	(0.0134)	(0.0136)	(0.0137)
Profitability	0.0521	0.0647	0.0628	0.0569
	(0.0394)	(0.0408)	(0.0409)	(0.0416)
Growth	**-0.0200*** **	**-0.0213*** **	**-0.0214*** **	**-0.0210*** **
	(0.0076)	(0.0077)	(0.0077)	(0.0076)
Size	**-0.0215*** **	**-0.0255*** **	**-0.0252*** **	**-0.0249*** **
	(0.0044)	(0.0057)	(0.0057)	(0.0056)
Tangibility	**-0.1676*** **	**-0.1703*** **	**-0.1703*** **	**-0.1691*** **
	(0.0574)	(0.0574)	(0.0574)	(0.0575)
Dividend_payout	0.4041	0.3802	0.3871	0.3844
	(0.2763)	(0.2718)	(0.2732)	(0.2592)
Board_Owners		-0.0850		
		(0.0532)		
Exec_Owners			-0.0618	
			(0.0631)	
Non_Exec_Owners			-0.1098	-0.1130
			(0.0803)	(0.0799)
CEO_CFO				-0.0686
				(0.0723)
TOT_Ins_Owners		0.0094	0.0079	
		(0.0376)	(0.0376)	
Indep_Owners				0.0282
				(0.0389)
Grey_Owners				**-0.2297***
				(0.1272)
Industry_dummy	Yes	Yes	Yes	Yes
Time_dummy	Yes	Yes	Yes	Yes
Constant	**9.8867*** **	**19.9659*** **	**19.1495*** **	**17.9939*** **
	(7.5917)	(18.3751)	(17.6056)	(16.5963)
Number of observation	2,086	2,086	2,086	2,086
Number of firms	244	244	244	244
Pseudo R-squared	0.4012	0.4026	0.4027	0.4036
Log likelihood	-833.2078	-831.3725	-831.2230	-829.9988
Area under the ROC curve	0.8851	0.8866	0.8868	0.8864

Overall, our regression results regarding low-leverage policy provide strong evidence for the trade-off theory. Specifically with regard to the size of a firm and assets tangibility, we find that firms that have small size and limited tangible assets are more likely to have a low leverage policy. Also, we find support for the pecking order theory as we document that a profitable firm would be more likely to avoid debt. However, we do not find evidence that underinvestment makes firms follow a low leverage policy. We then turn to the next sub-section, in which we empirically examine why firms are nearly low-levered.

4.4.3.2.2: Results for a firm's propensity to follow a nearly low-leverage policy

We now turn to the logistic regressions on nearly low-leverage policy. Table 4.7 presents the results from our pooled logistic regression analysis of a firm's propensity to be nearly low-leverage for the period of study, 2001-2013. We conduct similar regressions as in Table 4.6, however, with a dependent variable that takes the value of one if a firm has leverage that is lower than 5 per cent of both the optimal leverage and industry average (i.e., nearly low-levered (NLL)). The NLL firms have a leverage level that is between the LL firms and the NZL firms. The results in Table 4.7 enable us to explore firms' motive for adopting the NLL policy. In addition, the findings in the sub-section provide us the opportunity to compare NLL firms with the other firms. We fail to reject the null hypothesis that our models are correctly predicted: AUROC statistics of 0.91 per cent. For brevity, we do not discuss the results that have similar qualitative interpretations to those in Table 4.6.

The table reveals first that the coefficient on previous year's NLL decision is economically and statistically significant at the 1 per cent level in all models, ranging from 31.91 to 32.00. Second, we find that the coefficient on size is statistically significant at the 1 per cent level and negative. A one per cent increase in the size of a firm is associated with a statistically significant decrease of between 3.07 and 3.25 per cent in the likelihood that a firm would choose to have a low leverage (NLL) policy. This table confirms that small firms really follow financial conservative policies. In comparison with the LL policy, it appears that a firm has a greater likelihood of adopting NLL policy than LL policy when it is smaller.

Table 4:7: Pooled Logistic regressions of the determinants of the NLL policy

This table presents the results of the marginal effects from the logistic regressions of firms' Nearly Low-Leverage (NLL) decisions on the sample over 2001-2013. The dependent variable is a dummy variable that takes the value of one if a firm is NLL and 0 otherwise. Nearly Low-Leverage (NLL) firms are firms that have less than 5% of both predicted and industry average. Model 1 is the base model. In model 2 we examine the effect of the broad measure of ownership structure on NLL policy. In model 3 we replace the measure of board of directors' shareholding with the measure of executive directors' and non-directors' share-ownerships. In model 4 we replace executive directors' shareholdings with chief executive and chief finance officers' shareholding to examine the effect of chief executive and chief finance officers' shareholding on NLL policy. Also, in model 4 we replace total institutional investors shareholdings with the measures of independent and grey investors' shareholdings to examine the type of institutional investors that affect NLL policy. The signs ***, **, and * denote statistically significant coefficients at the 1%, 5% and 10% levels respectively. In parentheses are standard errors that are corrected for heteroscedasticity and clustered at the firm-level. The definitions of variables are presented in Appendix 2.3.

Variables	(1)	(2)	(3)	(4)
Previous NLL decision	**0.3200*** **	**0.3196*** **	**0.3193*** **	**0.3191*** **
	(0.0212)	(0.0212)	(0.0213)	(0.0215)
Profitability	0.0392	0.0443	0.0431	0.0361
	(0.0316)	(0.0326)	(0.0322)	(0.0329)
Growth	**0.0125** **	**0.0131** **	**0.0130** **	**0.0131** **
	(0.0054)	(0.0056)	(0.0056)	(0.0056)
Size	**-0.0325*** **	**-0.0314*** **	**-0.0311*** **	**-0.0307*** **
	(0.0052)	(0.0064)	(0.0063)	(0.0062)
Tangibility	-0.0967	-0.1017	-0.1014	-0.0990
	(0.0671)	(0.0658)	(0.0655)	(0.0651)
Dividend_payout	**0.6318** **	**0.6513** **	**0.6526** **	**0.6624** **
	(0.2709)	(0.2640)	(0.2638)	(0.2669)
Board_Owners		-0.0440		
		(0.0582)		
Exec_Owners			-0.0303	
			(0.0703)	
Non_Exec_Owners			-0.0591	-0.0632
			(0.0939)	(0.0949)
CEO_CFO				-0.0094
				(0.0760)
TOT_Ins_Owners		-0.0326	-0.0335	
		(0.0396)	(0.0397)	
Indep_Owners				-0.0120
				(0.0407)
Grey_Owners				**-0.2638** **
				(0.1311)
Industry_dummy	Yes	Yes	Yes	Yes
Time_dummy	Yes	Yes	Yes	Yes
Constant	**7.2399** **	6.9539	6.6523	5.8701
	(7.2707)	(8.7464)	(8.2534)	(7.0846)
Number of observation	2,086	2,086	2,086	2,086
Number of firms	244	244	244	244
Pseudo R-squared	0.4484	0.4491	0.4492	0.4506
Log likelihood	-635.6206	-634.7436	-634.6721	-633.0497
Area under the ROC curve	0.9105	0.9109	0.9109	0.9106

Second, we find that growth opportunities have a positive and statistically significant impact on a firm's propensity to follow NLL policy. This is the first strong evidence we find for the underinvestment argument, as we do not find a positive effect of growth opportunities for the LL firms. Specifically, Table 4.7 reveals that a one per cent increase in a firm's growth opportunities is associated with a statistically significant increase of between 1.25 and 1.31 per cent in the likelihood that the firm would have nearly low leverage policy. This finding provides strong support for the argument put forward by Myers (1977) that high-growth firms will eschew debt.

Third, we find that the coefficient on dividend pay-out is positive and statistically significant at the 5 per cent level. A one per cent increase in dividend pay-out leads to an increase of about 63.18 to 66.24 per cent in the likelihood that a firm would have a leverage level that is nearly low. The finding is comparable to the LL firms, in that though dividend payout positively influences firms' decision to adopt LL policy, the effect is not very significant. This suggests that firms that have high growth opportunities and distribute more dividends are more likely to be NLL. The implication of the finding is that an NLL firm, rather than take on more debt, may cut back cash distributions to shareholders so as to plough back its profits into retained earnings to finance its investment opportunity sets. The profitability and tangibility variables have the expected signs; however, they do not have statistically significant effect on the propensity to be NLL. Fourth, we consider the effect of tangibility ratio on the probability to follow NLL policy. Unlike the case of the LL firms, we find that availability of tangible assets does not have a statistically strong influence on NLL policy.

Considering whether ownership structure has an effect on firms' decision to be nearly low-levered, we find that firms that have larger insiders' ownership are not likely to be nearly low-levered, although the coefficient is not statistically significant. Further, we find that firms that have larger institutional investors' ownerships are more likely to be nearly low-levered: Both independent and grey owners appear to favour a nearly low-leverage policy. If a nearly low-leverage policy means that firms are not benefiting from the tax-advantage of debt, these findings suggest that the institutional investors may not be actively monitoring and involved in NLL policy.

Overall, the factors that influence firms' decisions to follow NLL policy differ from those that influence LL policy. There is a higher chance that a small firm would follow NLL policy than

that it would follow the LL policy. Also, there is strong influence of growth opportunities and dividend pay-out on firms' propensity to follow NLL policy, while there is a strong influence of tangible assets on firms' decisions to follow LL policy. Further, we find that the influence of insiders' ownerships is not statistically significantly on both the LL and NLL decisions. However, Tables 4.6 and 4.7 appear to show that insiders' ownerships tend to have higher economic impact on a firm's decision to follow NLL policy than they do in the LL policy. These findings confirm our earlier findings in the univariate tests that insiders hold more shares in NLL firms than they do in LL firms. Finally, the holdings of grey institutional investors seem to have stronger influence on whether a firm adopts NLL policy or not than their influence on the LL policy. These findings tend to explain why we found higher shareholding of grey investors in the NLL firms, in our univariate tests. A potential explanation for these findings is (looking at the findings from the perspective that the LL firms have higher leverage that the NLL firms) that grey institutional investors, which includes financial institutions, prefer to hold shares of firms with NLL policy to foster their own business of providing debts; hence, firms with high shareholding by grey investors are less likely to follow NLL policy. An alternative explanation is that, since the results of the univariate tests suggest that the NLL firms have higher holdings by grey institutional investors than the LL firms, firms with higher grey institutional investors' shareholdings may have easy access to debt markets because of the reputation of the grey investors and thus may have lower probability of adopting a conservative policy.

4.4.3.2.3: Results for a firm's propensity to follow a nearly zero-leverage policy

In this subsection we continue our exploration of firms' motives of firms to adopt different type of financial conservative policy that we identify earlier. Table 4.8 show the results from our pooled logistic regression analysis of a firm's propensity to adopt a nearly zero-leverage policy (NZL) for the period of study, 2001-2013. The NZL firms have a leverage level that is lower than the LL firms but higher than that of the ZL firms. We conduct similar regressions as in previous tables, but employ a dependent variable that takes the value of one if a firm has leverage that is lower than 1 per cent of both the optimal leverage and industry average (i.e., nearly zero-levered (NZL)). The models 1 - 4 of Table 4.8 are statistically significant at the 1 per cent level, have the Pseudo R-squared that ranges from 0.4526 to 0.4564. Second, the

previous year's NZL policy is economically and statistically significant at the 1 per cent level in models 1 - 4 ranging from 29.86 to 29.97. The results in this table enable us to examine the factors that induce firms to adopt NZL policy, as well as enable us compare the findings on NZL firms with the previous two firms.

Most of the signs on the coefficients in Table 4.8 are similar to those we find in Table 4.7. However, the statistical power and economic impacts in the two analyses are different. First, we find that a firm has about 8.9 to 10.5 per cent chance to have a NZL policy following a one per cent increase in its growth and it is statistically significant at the 5 and 10 per cent levels. The finding on growth opportunities in Table 4.8 is comparable to that in Table 4.7, in that in economic terms, growth opportunity appears to have a lower power to influence a firm to follow NZL policy than it does in the NLL decision. Second, we find that dividend paying firms are more likely to be nearly zero-levered, as increasing dividend payment by a point may lead to NZL policy by around 57.75 to 61.78 points. This is in line with the fact that dividend paying firms may not be credit constrained as they may choose to reduce the amount of cash that is being distributed to shareholders in order to make funds available to undertake valuable projects, rather than seek funds from debt markets. Statistically, the impact of dividend pay-out is stronger in the NZL policy than in the NLL policy, as it is significant at the 1 per cent level in all cases except one.

Furthermore, compared to our earlier findings in Tables 4.6 and 4.7, the shareholdings of the chief executive and chief finance officers (CEO_CFO) appear to have positive impact on firms' decisions to have NZL policy, although the impact is insignificant. A one per cent increase in the chief executive and chief finance officers' share-ownerships leads to a 2 per cent increase in the chance that the firm would have a NZL policy. Looking at this finding from the entrenchment and free-cash-flow views, it appears that when the strong executives (i.e., the CEO_CFOs) have high share-ownerships in a firm they may prefer that their firm has a nearly zero-leverage policy so as not to dilute the governance structure of the firm, to ensure they have control of the resources of the firms. Alternatively, from the alignment perspective, the chief executive and chief finance officers (CEO_CFO) may prefer to hold shares in NZL firms to send a signal to the markets. Lastly, we find that firms in which grey institutional investors have low shareholdings are more likely to be nearly zero-levered. The qualitative interpretation is similar to that above. Taking together our findings on the Grey_Owners and CEO_CFO, they indicate that the NZL policy may be somewhat motivated by agency

problems as there may be less monitoring of insiders' activities by institutional investors that have business relations with the firm (Chen et al. 2007; Cornett et al. 2007; Ferreira and Matos 2008).

4.4.3.2.4: Results for a firm's propensity to follow a zero-leverage policy

In Table 4.9 we present the results from the pooled logistic regression analysis of a firm's propensity to follow a zero-leverage (ZL) policy for period, 2001-2013. The study of the zero-levered firms helps us to provide detail insight to the extreme level of financial conservative policy as well as be able to compare the characteristics of the firms with other conservative policies. The models in Table 4.9 replicate those above. We assign the value of 1 to the dependent variable (ZL firms) if a firm has no outstanding debt in a given a year and 0 otherwise. For brevity, we shall not discuss the results that have similar qualitative interpretations to those above. The models in Table 4.8 are statistically significant and have Pseudo R-squared ranging from 0.6217 to 0.6235. The previous year's zero-leverage decision is economically and statistically significant at the 1 per cent level, ranging from 23.69 to 23.77. Most of our findings on the determinants of zero-leverage policy are qualitatively similar to our findings in the regression of the nearly zero-leverage policy, except that the coefficient on dividend pay-out is not statistically significant. The zero-leverage policy of our sample is significantly motivated by previous year zero-leverage policy, growth opportunities, firm size and presence of grey institutional investors.

Table 4:8: Pooled Logistic regressions of the determinants of NZL policy

This table presents the results of the marginal effects from the logistic regressions of firms' Nearly Zero-leverage (NZL) decisions on the sample over 2001-2013. The dependent variable is a dummy variable that takes the value of one if a firm is NZL and 0 otherwise. Nearly Zero-leverage (NZL) firms are firms that have less than or equal to 1% both predicted and industry average. Model 1 is the base model. In model 2 we examine the effect of the broad measure of ownership structure on NZL policy. In model 3 we replace the measure of board of directors shareholding with the measure of executive directors' and non-directors' share-ownerships. In model 4 we replace executive directors' shareholdings with chief executive and chief finance officers' shareholding to examine the effect of chief executive and chief finance officers' shareholding on NZL policy. Also, in model 4 we replace total institutional investors shareholdings with the measures of independent and grey investors' shareholdings to examine the type of institutional investors that affect NZL policy. The signs ***, **, and * denote statistically significant coefficients at the 1%, 5% and 10% levels respectively. In parentheses are standard errors that are corrected for heteroscedasticity and clustered at the firm-level. The definitions of variables are presented in Appendix 2.3.

Variables	(1)	(2)	(3)	(4)
Previous NZL decision	**0.2997*** **	**0.2993*** **	**0.2990*** **	**0.2986*** **
	(0.0222)	(0.0221)	(0.0221)	(0.0223)
Profitability	0.0469	0.0471	0.0457	0.0389
	(0.0302)	(0.0307)	(0.0305)	(0.0307)
Growth	**0.0089***	**0.0105** **	**0.0104** **	**0.0104***
	(0.0051)	(0.0053)	(0.0053)	(0.0053)
Size	**-0.0331*** **	**-0.0285*** **	**-0.0281*** **	**-0.0278*** **
	(0.0056)	(0.0066)	(0.0066)	(0.0064)
Tangibility	-0.0642	-0.0715	-0.0714	-0.0702
	(0.0632)	(0.0615)	(0.0613)	(0.0610)
Dividend_payout	**0.5775** **	**0.6062*** **	**0.6070*** **	**0.6178*** **
	(0.2347)	(0.2243)	(0.2238)	(0.2285)
Board_Owners		-0.0154		
		(0.0542)		
Exec_Owners			0.0001	
			(0.0677)	
Non_Exec_Owners			-0.0332	-0.0374
			(0.0865)	(0.0871)
CEO_CFO				0.0207
				(0.0728)
TOT_Ins_Owners		-0.0564	-0.0574	
		(0.0400)	(0.0401)	
Indep_Owners				-0.0353
				(0.0411)
Grey_Owners				**-0.2945** **
				(0.1290)
Industry_dummy	Yes	Yes	Yes	Yes
Time_dummy	Yes	Yes	Yes	Yes
Constant	**9.5346** **	4.5219	4.2676	3.8321
	(10.6700)	(6.1402)	(5.7561)	(4.9976)
Number of observation	2,086	2,086	2,086	2,086
Number of firms	244	244	244	244
Pseudo R-squared	0.4526	0.4542	0.4543	0.4564
Log likelihood	-587.5461	-585.8025	-585.6922	-583.5137
Area under the ROC curve	0.9148	0.9156	0.9156	0.9154

Table 4:9: Pooled Logistic regressions of the determinants of ZL policy

This table presents the results of the marginal effects from the logistic regressions of firms' Zero-leverage (ZL) decisions on the sample over 2001-2013. The dependent variable is a dummy variable that takes the value of one if a firm is ZL and 0 otherwise. Zero-leverage (ZL) firms' status implies having no leverage in a given year. Model 1 is the base model. In model 2 we examine the effect of the broad measure of ownership structure on ZL policy. In model 3 we replace the measure of board of directors shareholding with the measure of executive directors' and non-directors' share-ownerships. In model 4 we replace executive directors' shareholdings with chief executive and chief finance officers' shareholding to examine the effect of chief executive and chief finance officers' shareholding on ZL policy. Also, in model 4 we replace total institutional investors shareholdings with the measures of independent and grey investor's shareholdings to examine the type of institutional investors that affect ZL policy. The signs ***, **, and * denote statistically significant coefficients at the 1%, 5% and 10% levels respectively. In parentheses are standard errors that are corrected for heteroscedasticity and clustered at the firm-level. The definitions of variables are presented in Appendix 2.3.

Variables	1	2	3	4
Previous ZL decision	**0.2377*** **	**0.2376*** **	**0.2377*** **	**0.2369*** **
	(0.0190)	(0.0190)	(0.0190)	(0.0190)
Profitability	0.0179	0.0146	0.0151	0.0099
	(0.0197)	(0.0200)	(0.0201)	(0.0194)
Growth	**0.0092** **	**0.0100** **	**0.0100** **	**0.0101** **
	(0.0040)	(0.0040)	(0.0040)	(0.0040)
Size	**-0.0151*** **	**-0.0127*** **	**-0.0128*** **	**-0.0125*** **
	(0.0036)	(0.0041)	(0.0041)	(0.0040)
Tangibility	-0.0369	-0.0387	-0.0387	-0.0382
	(0.0363)	(0.0360)	(0.0361)	(0.0355)
Dividend_payout	0.0923	0.1008	0.1008	0.0976
	(0.0986)	(0.0959)	(0.0959)	(0.0990)
Board_Owners		0.0118		
		(0.0300)		
Exec_Owners			0.0081	
			(0.0404)	
Non_Exec_Owners			0.0155	0.0157
			(0.0419)	(0.0421)
CEO_CFO				0.0240
				(0.0437)
TOT_Ins_Owners		-0.0204	-0.0201	
		(0.0201)	(0.0201)	
Indep_Owners				-0.0084
				(0.0209)
Grey_Owners				**-0.1474***
				(0.0774)
Industry_dummy	Yes	Yes	Yes	Yes
Time_dummy	Yes	Yes	Yes	Yes
Constant	**14.3721** **	6.4917	6.7027	5.6233
	(18.7131)	(9.5160)	(9.8511)	(8.0620)
Number of observation	2,077	2,077	2,077	2,077
Number of firms	243	243	243	243
Pseudo R-squared	0.6217	0.6223	0.6223	0.6235
Log likelihood	-382.8285	-383.2283	-382.2175	-380.9717
Area under ROC curve	0.9535	0.9534	0.9535	0.9523

Overall, this sub-section reveals that leverage conservative (i.e., LL, NLL, NZL and ZL) firms are not homogeneous. The factors that make firms follow the four different leverage conservative policies are not similar. Specifically, the low-levered (LL) policy is statistically motivated by profitability, size and tangibility. The nearly low-leverage (NLL) policy is statistically influenced by growth opportunities, size, dividend pay-out and the presence of grey institutional investors. The nearly zero-leverage (NZL) policy is statistically triggered by factors like size, dividend pay-out and the presence of grey institutional investors and finally, zero-leverage (ZL) firms eschew debt statistically because of their growth opportunities, size and presence of grey institutional owners. Next, we examine the role of derivatives usage in firms' propensity to be leverage conservative.

4.4.3.3: Logistic regression of the role of derivatives usage in conservative leverage policies

In this subsection, we investigate whether the use of derivatives has any role in firms' decision to follow leverage conservative policies. We argue that a leverage conservatism policy would be less attractive to derivatives users because of the reduced cost of borrowing. By construction, derivatives usage is a dummy variable that takes the value of 1 if a firm hedges with financial derivative instruments (foreign exchange, interest rate and/or commodity derivatives) and 0 otherwise. Table 4.10 presents the results of the logistic regressions of our analysis using a sample of UK non-financial firms over 2005-2011. We control for all the variables in the last models in the previous section and include the derivatives dummy. Also, we control for time and industry effects. Model 1 of Table 4.10 shows the results of the analysis for the low-leverage (LL) firms. Model 2 presents the results of the analysis for the nearly low-leverage (NLL) firms. Model 3 shows the results of the analysis for the nearly zero-leverage (NZL) firms and model 4 presents the results of the analysis for the zero-leverage (ZL) firms.

The economic and statistical implications of derivatives usage are different across the models however; the coefficient estimates for derivatives usage are negative, suggesting that firms that have a hedging policy in place are not likely to be conservatively leveraged. Looking at the coefficient on derivatives usage, we find that the economic significance of the variable

increases as firms move from the extreme case of conservatism: zero-leverage policy to the low-leverage policy. As shown in Table 4.10, the odds ratio for derivatives usage is -5.85 in model 1 and -1.38 in model 4. These findings imply that a hedging firm has a 6 per cent lower probability of adopting low-leverage policy and a 1.4 per cent lower probability of following a zero-leverage policy. We conduct the likelihood ratio tests to test the null hypothesis that the coefficients on the derivatives usage are zero (for each case: models 1 – 4). We strongly reject the null hypothesis in all cases, except in model 4.

We proffer some potential explanations for these findings. First, from the supply side, derivatives users find it easier to borrow at the debt market as they may be able to access debt at reduced costs. This is in line with the argument in some past papers that derivatives users may not have to promise to hedge after debt issuance; hence, debt providers are confident that they would not lose their wealth to shareholders (Smith and Stulz 1998). Second, from the demand side, a firm that finds it difficult to access the derivatives markets may abstain totally from or use little debt if it knows it would not be able to hedge the risk of financial distress (this interpretation holds if there is an association between leverage and the costs of encountering financial distress). Finally, taking the results on derivatives usage together with firm size, this also suggests that small firms may not have the sophistication to access derivatives markets and may find it difficult to borrow at the debt market as they lack the credibility to do so; hence, they are leverage conservative.

In sum, we find strong evidence to support our hypothesis with regard to the influence of derivatives usage on leverage conservative policy, especially for the low-leverage and nearly low-leverage policies. In the next section, we conduct several sensitivity analyses to examine how marginal change in some firm-specific characteristics affects leverage conservatism.

Table 4:10: Pooled Logistic regression of the deterministic role of corporate hedging on financial conservatism policies

This table presents the marginal effects from the logistic regressions that examine the deterministic role of derivative usage on leverage conservatism using a sample period of 2005-2011. The dependent variable in model (1) is a dummy variable that takes the value of one if a firm is LL. The dependent variable in model (2) is a dummy variable that takes the value of one if a firm has leverage that is less than or equal to 5% of both the predicted and industry average (NLL). The dependent variable in model (3) is a dummy variable that takes the value of one if a firm has leverage that is less than or equal to 1% of both the predicted and industry average (NZL). The dependent variable in model (4) is a dummy variable that takes the value of one if a firm has no leverage (ZL) and 0 otherwise respectively. The signs ***, **, and * denote statistically significant coefficients at the 1%, 5% and 10% levels respectively. LR Chi (1) is the likelihood ratio tests that test the null hypothesis that the coefficients on the derivatives usage are zero. We report the chi^2 and the p-value. In parentheses are standard errors that are corrected for heteroscedasticity and clustered at the firm-level. The definitions of variables are presented in Appendix 2.3.

	LL	NLL	NZL	ZL
Variables	(1)	(2)	(3)	(4)
Previous LL decision	**0.3782*** **			
	(0.0164)			
Previous NLL decision		**0.2936*** **		
		(0.0212)		
Previous NZL decision			**0.2804*** **	
			(0.0215)	
Previous ZL decision				**0.2255*** **
				(0.0208)
Profitability	**0.0893***	0.0325	0.0439	0.0293
	(0.0472)	(0.0471)	(0.0362)	(0.0213)
Growth	-0.0134	**0.0167** **	**0.0154** **	**0.0136*** **
	(0.0093)	(0.0073)	(0.0070)	(0.0047)
Size	**-0.0202*** **	**-0.0202*** **	**-0.0205*** **	**-0.0117** **
	(0.0069)	(0.0069)	(0.0067)	(0.0046)
Tangibility	**-0.1867*** **	**-0.1089***	-0.0760	-0.0313
	(0.0680)	(0.0627)	(0.0567)	(0.0308)
Dividend_payout	0.2819	**0.7492*** **	**0.6771*** **	0.1979
	(0.2518)	(0.2846)	(0.2493)	(0.1716)
Non_Exec_Owners	**-0.1629***	-0.0471	-0.0336	0.0225
	(0.0906)	(0.0892)	(0.0833)	(0.0395)
CEO_CFO	0.0071	0.0166	0.0174	0.00279
	(0.0963)	(0.0864)	(0.0780)	(0.0541)
Indep_Owners	0.0337	-0.0391	-0.0628	-0.0171
	(0.0504)	(0.0462)	(0.0440)	(0.0275)
Grey_Owners	-0.1838	-0.2186	-0.2178	-0.1230
	(0.1593)	(0.1467)	(0.1355)	(0.0855)
Hedging_decision	**-0.0585** **	**-0.0544** **	-0.0347	-0.0138
	(0.0271)	(0.0274)	(0.0257)	(0.0156)
Industry_dummy	Yes	Yes	Yes	Yes
Time_dummy	Yes	Yes	Yes	Yes
Constant	**7.4650***	5.0384	6.2575	1.3987
	(8.3663)	(7.2634)	(9.7744)	(2.4533)
Number of observation	1,218	1,218	1,218	1,215
Number of firms	230	230	230	229
Pseudo R-squared	0.3982	0.4603	0.4827	0.6398
Log likelihood	-479.513	-349.776	-314.863	-203.711
LR $Chi^2(1)$	**5.49** **	**2.91***	**6.61*** **	0.76
Area under the ROC curve	0.8894	0.9146	0.9252	0.9584

4.5: Further Checks

In this section, we present the results of the additional test that we conduct to verify the robustness of our empirical findings. We replicate the multivariate analysis for low-leverage policy using a fixed threshold classification by considering neither the optimal leverage level nor the industry average. We classify a firm as conservative by using a fixed threshold criterion if it has a leverage level that is less than or equal to 10 per cent. About 19.24 per cent of our sample is classified as being conservative using this classification. Table 4.11 shows the results of the logistic regressions. For brevity, we omit the explanations of the results, as the findings are similar to those in the zero-leverage policy above. In sum, we find that growth opportunities, firm size and the presence of grey institutional investors are firm-level factors that make firms adopt a leverage conservative policy.

4.6: Sensitivity Analysis

In this section, we carry out several sensitivity analyses to show the impact of percentage change in some firm-specific characteristics on percentage change in two opposite extreme cases of leverage conservatism policies; the low- and the zero-leverage policies. Fig. 4.1 (Fig. 4.2) shows the patterns of the change in propensity to adopt a low-leverage (zero-leverage) policy following some percentage change in six different firm characteristics. Overall, our findings are similar to those reported in Tables 4.6 and 4.9. Also, the figures reveal that the sensitivity of LL policy to firm characteristics differs from the sensitivity of ZL policy to firm characteristics.

First, Fig.4.1.a shows a sensitivity estimate that the probability that a firm would adopt low-leverage policy is negatively associated with tangible assets. There is about a 37 per cent chance that a firm would follow a low-leverage policy if it has a 20 per cent mean of tangible assets. When tangible assets increase to about 80 per cent, the chance that the firm would follow the policy decreases to approximately 26 per cent; which represents about a 39.73 per cent decline. These findings corroborate our earlier findings that low-levered firms have followed the conservative policy because they find it difficult to access the debt market due to lack of collateral assets.

Table 4:11: Robustness check for the determinants of LL policy

This table presents the results of the marginal effects from the logistic regressions of firms that have conservative leverage decisions on the sample over 2001-2013. The dependent variable is a dummy variable that takes the value of one if a firm is NZL and 0 otherwise. We classified a firm as conservative by using a fixed threshold criterion if it has a leverage level that is less than or equal to 10 per cent. The signs ***, **, and * denote statistically significant coefficients at the 1%, 5% and 10% levels respectively. In parentheses are standard errors that are corrected for heteroscedasticity and clustered at the firm-level. The definitions of variables are presented in Appendix 2.3.

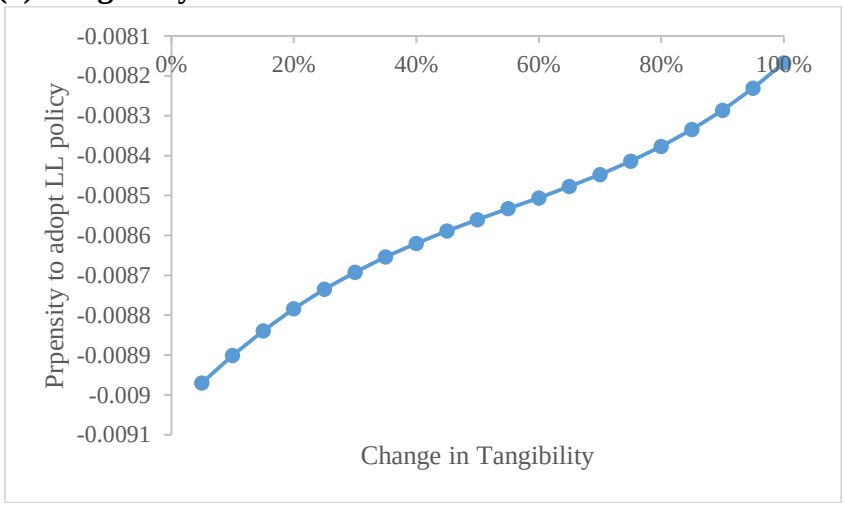
Variables	(1)	(2)	(3)	(4)
Previous conservative decision	**0.2376*** **	**0.2375*** **	**0.2375*** **	**0.2366*** **
	(0.0190)	(0.0189)	(0.0190)	(0.0190)
Profitability	0.0193	0.0155	0.0155	0.0103
	(0.0194)	(0.0198)	(0.0199)	(0.0192)
Growth	**0.0099** **	**0.0106*** **	**0.0106*** **	**0.0106*** **
	(0.0039)	(0.0039)	(0.0039)	(0.0038)
Size	**-0.0153*** **	**-0.0128*** **	**-0.0128*** **	**-0.0125*** **
	(0.0036)	(0.0041)	(0.0041)	(0.0040)
Tangibility	-0.0370	-0.0386	-0.0386	-0.0383
	(0.0364)	(0.0361)	(0.0361)	(0.0356)
Dividend_payout	0.0849	0.0943	0.0943	0.0918
	(0.0917)	(0.0899)	(0.0898)	(0.0934)
Board_Owners		0.0149		
		(0.0293)		
Exec_Owners			0.0146	
			(0.0381)	
Non_Exec_Owners			0.0152	0.0155
			(0.0421)	(0.0422)
CEO_CFO				0.0307
				(0.0410)
TOT_Ins_Owners		-0.0206	-0.0206	
		(0.0201)	(0.0201)	
Indep_Owners				-0.0087
				(0.0208)
Grey_Owners				**-0.1489***
				(0.0774)
Industry_dummy	Yes	Yes	Yes	Yes
Time_dummy	Yes	Yes	Yes	Yes
Constant	**14.7704** **	6.2606	6.2755	5.2814
	(19.3064)	(9.1800)	(9.2200)	(7.5687)
Number of observation	2,086	2,086	2,086	2,086
Number of firms	244	244	244	244
Pseudo R-squared	0.6221	0.6228	0.6228	0.6241
Log likelihood	-383.6418	-382.9405	-382.9405	-381.5866
Area under the ROC curve	0.9536	0.9535	0.9535	0.9525

Second, according to Fig. 4.1.b, there is a steady increase in the propensity of a firm to adopt low-leverage policy, as we find that 20 per cent profitability leads to about 0.25 per cent chance of following LL policy. This represents an increase of about 0.3 per cent when profit increases to 95 per cent. Third, Fig. 4.1.c shows that total institutional shareholding has a positive impact on a firm's propensity to have a low-leverage policy. This finding confirms that the presence of institutional investors may make it relatively less costly for firm to access debt because the debt market believes that the activities of the firms can be monitored and influenced.

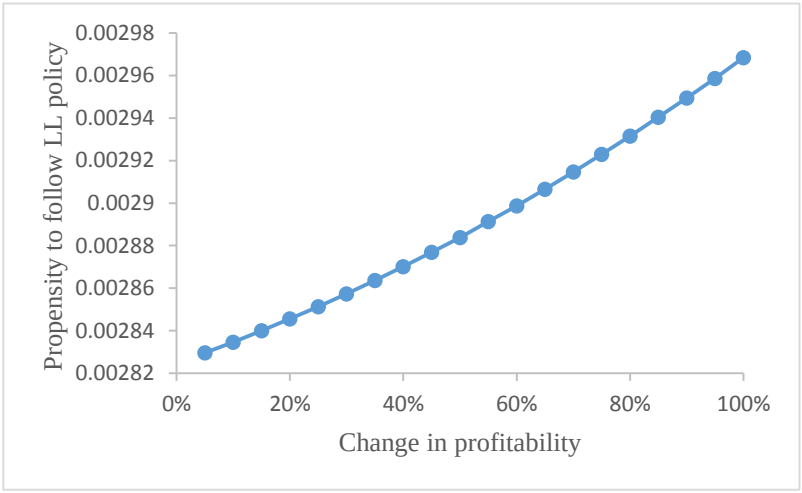
In Fig. 4.2 we estimate the sensitivity of the likelihood of having zero-leverage policy relative to changes in the same firm-characteristics as in Fig. 4.1. The qualitative interpretations of Fig. 4.2 appear to be the same as those in the above; nevertheless, their economic interpretations are very different. In Fig. 4.2.a, we find that having tangible assets equal to 10 per cent of our mean give a firm about 19.7 per cent chance of having a zero-leverage policy. With tangible assets of about 60 per cent, there is an 18 per cent chance that a firm would be conservatively levered. Fig. 4.2.b suggests that a firm has a 19 per cent chance of being zero-levered if it has a low profit at 10 per cent of our mean. However, the chance that the firm would have the policy increases to 20 per cent when profit increases by 87 per cent.

In Fig. 4.2.c, we present the sensitivity of ZL policy and the share-ownership of total institutional investors. The figure shows that a firm that has total institutional owners may not consider following ZL policy. Overall, our results confirms that tangibility, hedging decision and ZL policy may be closely linked because hedging and leverage policies involve firms making promises to pay, which thus are limited by collateral constraints (Rampini and Viswanathan 2010).

(a) Tangibility



(b) Profitability



(c) Total institutional ownership

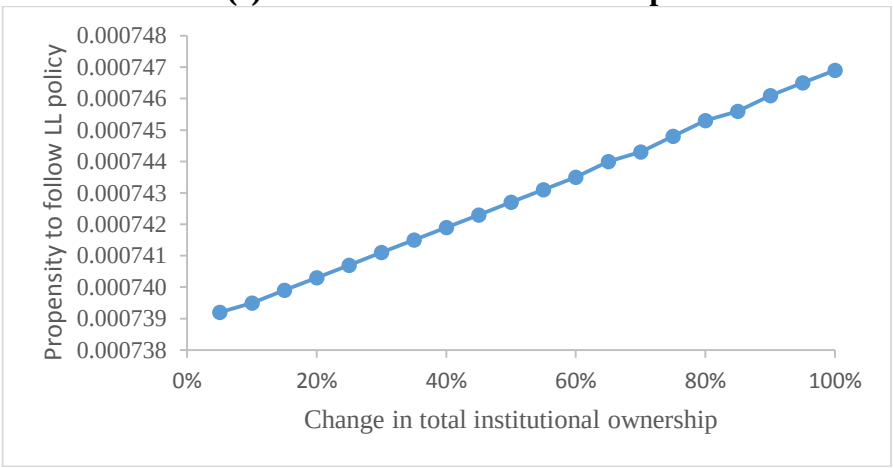
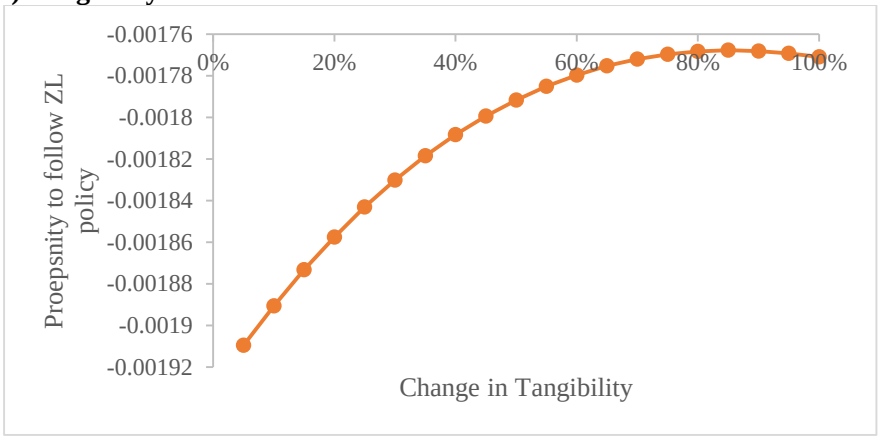
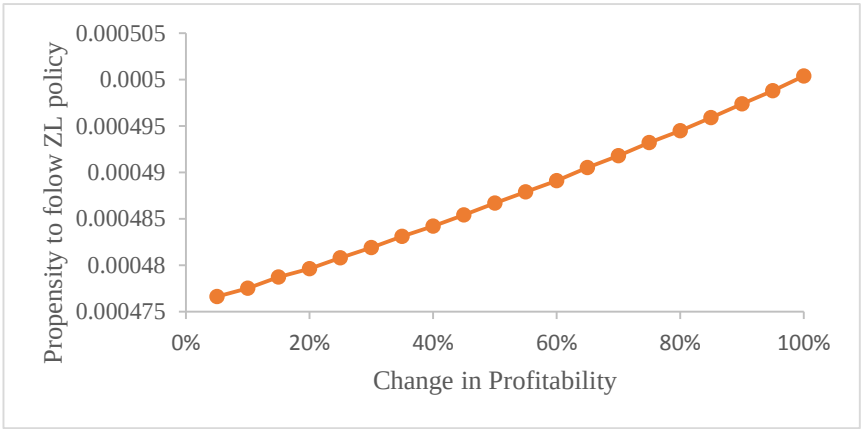


Figure 4:1: The marginal effects of the propensity to follow a low-leverage policy.

(a) Tangibility



(b) Profitability



(c) Total institutional ownerships

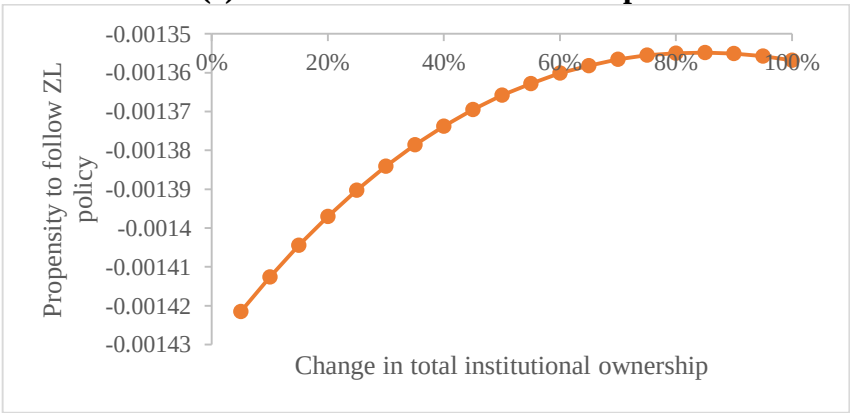


Figure 4:2: The marginal effects of the propensity to adopt a zero-leverage policy.

4.7: Conclusion

It is theoretically puzzling that some firms are leveraged conservatively in spite of the advantages of debt financing. Using a sample of firms that are listed on the London Stock Exchange over the period 2000-2013, this chapter empirically investigates why firms adopt leverage conservative policies. We examine (1) whether there is a difference between the low-leverage and the extreme level of leverage conservatism i.e., zero-leverage; (2) the firm-level factors that make firms adopt the different types of leverage conservative polices i.e., low-leverage, nearly low-leverage, nearly zero-leverage and zero-leverage; (3) the role of derivatives usage in firms' decision to adopt leverage conservative policies. We put forward the argument that leverage conservative policies would be less attractive to firms that hedge with derivatives as they would find it easy to borrow at the debt market due to the reduced costs of financing.

This chapter contributes to the study on capital structure in two main respects. First, the chapter contributes to existing knowledge by examining four different types of leverage conservatism i.e., low-leverage, nearly low-leverage, nearly zero-leverage and zero-leverage. This is to establish whether the firm-level factors that make firms adopt these different policies are different. Second, the chapter adds to existing empirical studies in the methods we have employed to identify whether a firm is conservative or not. First, we estimate a leverage model using the system generalised methods of moments (SYS-GMM) to predict each firm's optimal leverage level, which is then used to identify whether firm is conservative or not. This method enables us to take into consideration information asymmetry, underinvestment and financial constraints of our sample when classifying firms as conservative or not.

Also, the method gives us the opportunity to overcome the shortcoming of the fixed classification methods used in prior studies, in that we are able to properly separate firms that have a sub-optimal leverage level from those that have optimal leverage, even when they have similar leverage levels. Second, we impose another stringent rule, that conservative firms must have a leverage level that is below their industry average. We use this additional condition to overcome the possibility that some unprofitable firms might have a leverage level that is above the predicted optimal level, although they might not be able to carry leverage that is above that of other firms in their industry (Ozkan 2001). Further, this empirical chapter contributes

to knowledge as it benefits from new derivative usage data, carefully and uniquely collected by hand from firms' annual reports to investigate the role of derivatives usage in firms' leverage conservative decisions. To the best of our knowledge, this is the first empirical study that incorporates derivatives usage into the study of leverage conservatism.

Our study reveals very important findings. We find that leverage conservatism is pro-cyclical as the percentage of firms that adopt the policy drops sharply during a financial crisis and rises afterwards. The factors that make firms adopt diverse leverage conservative policies are not similar. We divide leverage conservative firms into four different types: the low-, nearly low-, nearly zero-, and zero-leverage firms. We find that the zero-leverage firms are smaller, have the lowest share of investments by institutional investors, lowest investment in capital expenditure and tangible assets. Also, they have higher growth opportunities and insiders' share-ownerships than other firms that follow other leverage conservative policies. Further, we show that firms that do not hedge have a higher propensity to have leverage conservative policies, especially for the low and nearly low-leverage policies.

In conducting this empirical work, the study faced some limitations. The first limitation of the chapter relates to our choice of leverage model, which may have impacted the leverage level that we estimate and the deviation from it. In the study, we employ the book leverage. According to Welch (2011), book leverage may be subject to some measurement issues. Also, the use of a dummy variable as proxy for derivatives usage may limit our knowledge, to the extent that this study cannot quantify the degree to which past year's derivative usage influences firms' decision to follow a leverage conservative policy. Hence, further research is needed to fill this gap. Further, future research may extend the study to examine how the different types of leverage conservative policy affect firm performance.

The other important implications of the chapter, which are worth considering in future research on capital structure, are as follows: First, our study shows that leverage conservative firms are not homogeneous. The firm-specific factors that make firms pursue low-leverage, nearly-low-leverage, nearly zero-leverage and zero-leverage policies are not similar. Future research should therefore take into consideration the difference between these policies when investigating leverage conservatism. Second, future research should consider firms' optimal leverage level when identifying leverage conservative firms, to avoid misclassification of firms. The role of a firm's desired leverage level should not be ignored as it reveals whether

the firms under study have optimal behaviour in the first place. The optimal leverage level would help separate firms that have optimal behaviour from those that have not, as it does not make economic sense to investigate firms with a sub-optimal leverage level. Next, to the extent that derivatives usage has impacts on conservative leverage decisions, future research should extend the line of study by investigating whether leverage conservative policies lead to improve firm value. Finally, it would be interesting to know the implications of the financial crisis on firms' decision to be levered conservatively.

CHAPTER 5: CONCLUSION

The focal objective of this thesis is to shed more light on the determinants of corporate hedging, the implications of hedging, and the determinants of leverage conservatisms. In achieving this objective, we use detailed and novel information about the UK non-financial firms to conduct and present robust analysis in three different empirical frameworks.

In the first empirical study, we investigate the incentives of corporate hedging. The objectives of the chapter are to investigate the motives for hedging in general as well as to ascertain whether incentives for hedging are been influenced by macroeconomic conditions. The analysis of the full sample period, 2005-2011, shows that probability of encountering financial distress, underinvestment costs, foreign exchange exposure and firm size have significant influence on a firm's decision to hedge. In addition, we find that the shareholdings of institutional investors have positive and significant effect on hedging, suggesting that institutional investors in the UK effectively monitor and influence management to engage in value-maximising policies. Also, we find that the shareholdings of independent institutional investors have positive and significant effect on hedging decisions, which is consistent with the argument that institutional investors that have lower monitoring costs may effectively put pressure on management to adopt a particular policy. In the analysis of the sub-periods, i.e., pre-financial crisis, during financial crisis and after financial crisis, we show that factors that induce firms to hedge in the three sub-periods are largely different. Specifically, we find that the economic impact of expected costs of financial distress on propensity to hedge is weaker in periods before a financial crisis than during or after a financial crisis. The strongest impact of expected costs of financial distress on hedging is after a financial crisis. Furthermore, we find that the association between tax liability and hedging policy is significantly positive during the crisis, and insignificant in the pre- and post-crisis periods. Moreover, we document that the effect of institutional (independent) investors' shareholdings on hedging decision is positive and significant in the pre-crisis period only.

In the second empirical chapter, we investigate the impact of hedging on firm performance by considering the joint effect of derivative usage and ownership structure on firm performance. The central objective of the chapter is to shed more light on the research questions, is there a performance benefit to corporate hedging? If there is, how does ownership structure affect the

relation between hedging and firm performance? And lastly, what type of owners (board of directors or institutional) influence the relation between hedging and performance? The findings in this chapter are robust to several econometric specifications. We find that the hedging policy of our sample does not positively impact firm performance. In economic terms, there is evidence that firms that hedge with derivatives may experience worse performance than firms that do not hedge with derivatives. The use of derivatives appears to be important for firm performance during the global financial crisis in 2008, but a performance-destroying strategy during normal macroeconomic conditions. We also find that non-hedgers are more profitable than hedgers and their performance is significantly different from that of hedgers. Also, institutional investors tend to be very active in the group as they show higher coefficients than hedgers. These findings suggest that although non-hedgers may not find it very easy to access the derivatives market because it is too sophisticated for them, this group of firms may strategically be exploring other capital markets in the different regions in which they invest, in order to obtain finances to fund their profitable projects; and the few institutions that invest in such firms are active in monitoring the investment activities.

Further, our results extend the previous literature on corporate hedging and firm performance, in that we investigate the joint effect of derivative usage and ownership structure on firm performance. If the relationship that exists between derivatives usage and firm performance is subject to market frictions like agency problems between managers and shareholders and if ownership structure can be used to reduce agency problems then, to the extent that the board of directors and institutional investors hold shares in firms, the interaction of derivatives usage and ownership structure should have no role to play in performance. We find evidence that there is no performance benefit associated with the use of derivatives when ownership structure is high. We find no difference between the performance of firms that have high ownership and those with low ownership. Further, we observe that when the board of directors' ownership stake is high, there is possibility that institutional investors may concur with the decisions made by the management. These findings suggest that institutional investors may not have incentive to monitor and exert influence on the performance of all types of firms. In summary, the chapter has provided plausible evidence that could have huge implications in the corporate and academic environments that the performance of firms may be jointly impacted by risk management policies and ownership structure.

Finally, in the last empirical chapter we explore the motives for corporate leverage conservatism policies by employing a sample of firms that are listed on the London Stock Exchange over the period 2000-2013. The chapter examines three main research questions. First, we investigate whether there is a difference between the low-leverage and the extreme level of leverage conservatism, i.e., zero-leverage. Second, the chapter examines the firm-level factors that make firms adopt the different types of leverage conservative polices, i.e., low-leverage, nearly low-leverage, nearly zero-leverage and zero-leverage, and lastly the chapter addresses whether hedging plays any role in firms' decision to adopt leverage conservatism policies. The chapter reveals that leverage conservatism is pro-cyclical as the percentage of firms that adopt the policy drops sharply during a financial crisis and rises afterwards. Also, we find that the factors that make firms adopt diverse leverage conservatism policies are not similar. The zero-leverage firms are smaller, have the lowest share of investments from institutional investors, lowest investment in capital expenditure and tangible assets. Also, they have higher growth opportunities and insiders' share-ownerships than other firms that follow other leverage conservatism policies. Further, we show that firms that do not hedge have a higher propensity to have leverage conservatism policies, especially for the low and nearly low-leverage policies.

This thesis adds several novel insights to existing knowledge relating corporate hedging, ownership structure, and leverage conservative policies. First, this study employs carefully and uniquely hand-collected data about UK firms' derivatives usage as well as their firm ownership structures. Second, the study employs a sample period that includes a period of financial crisis (2008-2009), which affords the unique opportunity to present findings from a natural experience of a financial crisis. In the first empirical study, we present evidence that factors that induce hedging policy are largely influenced by the prevailing macroeconomic situations.

In the second empirical study, we further add to knowledge in the ways in which we compute some of the explanatory variables used in our regression. For example, we use average information of the variables (e.g., average of 2005 and 2006 data), which we believe controls for possible measurement errors and extreme values that might be present in a particular year. Furthermore, distinct from prior empirical studies on the implications of derivative usage, we effectively control for the endogeneity problem that may arise in our examination of the unconditional impacts of derivative usage on firm performance by first introducing firm

ownership structure variables into our estimations to serve as exogenous variables, and then estimating a partial dynamic performance equation. We estimate that firm performance at time *t* is a function of the explanatory variables at time *t-1*.

The third empirical chapter adds to knowledge on leverage conservatism policies, in that we examine four different types of leverage conservatism, i.e., low-leverage, nearly low-leverage, nearly zero-leverage and zero-leverage, and document that there are differences between the factors that make firms adopt these different policies. Also, the chapter adds to existing empirical studies in the methods we have employed to identify whether a firm is conservative or not. Further, the empirical chapter contributes to knowledge as it benefits from new derivatives usage data that is carefully and uniquely collected by hand from firms' annual reports to investigate the role of hedging in firms' leverage conservatism decisions. To the best of our knowledge, this is the first empirical study that incorporates derivatives usage into the study of leverage conservatism.

This thesis offers several important implications for future research. First, to the extent that this present study has been able to provide a unique finding that determinants of hedging differ during a financial crisis, in future research to assess the outstanding balances of corporate derivatives, there is a need to understand in value terms, the extent to which firms change their hedging decisions during financial crisis, following change in their incentives to hedge. Second, our study highlights the role of the prevailing macroeconomic conditions on the relation between hedging and performance. However, this study does not investigate how the prevailing macroeconomic situation impacts the interaction of hedging and ownership structure on performance. Thus, future research may examine whether the unconditional effects of hedging on firm performance differ during a financial crisis period. Next, to the extent that derivatives usage has impacts on conservative leverage decisions, future research should extend the line of study by investigating whether leverage conservative policies lead to improve firm value. Finally, it would be interesting to know the implications of the financial crisis on firms' decision to be levered conservatively.

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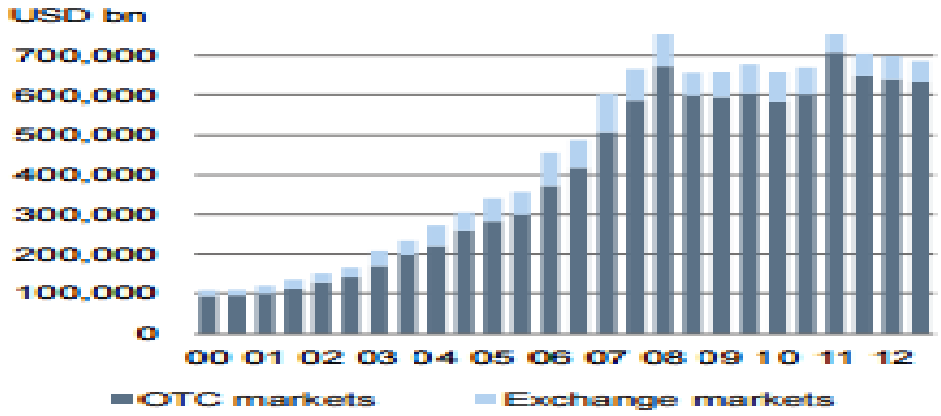
Appendices

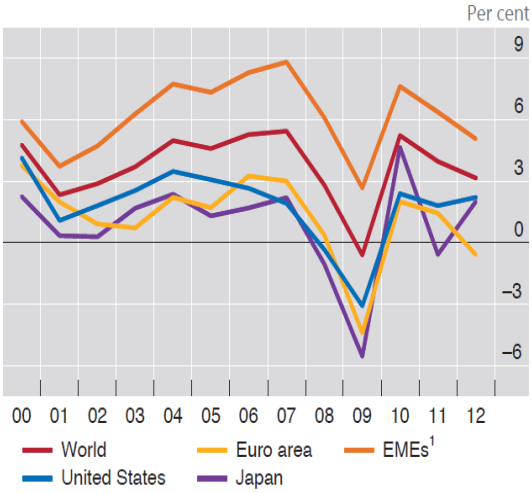
Appendix 1.1: Derivatives market: - Notional amounts outstanding



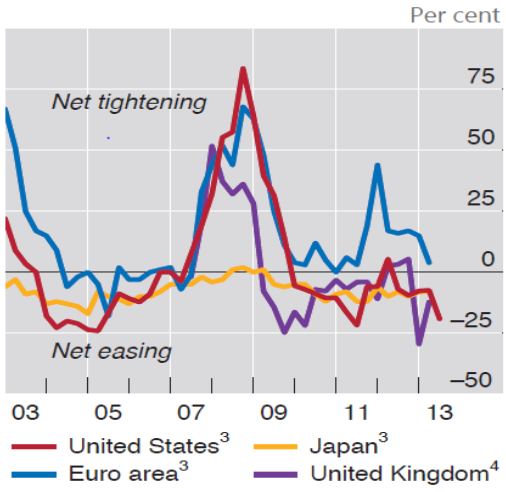
Source: BIS cited by Kaya (2013).

Appendix 2.1: Overview of global economic activity

(a). GDP growth, by year



(b). Lending surveys: Business loans[2]



[1]Based on IMF aggregate; [2]For the United States, loans to large and middle-sized businesses; for the United Kingdom, loans to all businesses; for the euro area and Japan, loans to large businesses. [3]Fraction of banks that reported having tightened standards ("tightened considerably" or "tightened somewhat") minus the fraction of banks that reported having eased standards ("eased considerably" or "eased somewhat"). A positive net balance indicates a net tightening in credit standards. [4]Weighted percentage of banks reporting tightened credit conditions minus weighted percentage of those reporting eased credit conditions (weights are based on relevant market share). A positive weighted net balance indicates a net tightening in credit standards.

Source: BIS

Appendix 2.2: List of Keywords

This is the list of keywords used in annual reports search criteria in identifying firms' hedging activities.

''Derivative*''
''Rate'' with ''Swap*''
''Futures''
''Hedging''
''Forward''
''Swaption*''
''Foreign'' with ''Currency'' with ''Option*''
''Foreign'' with ''Currency'' with ''Forward*''
''Foreign'' with ''Currency'' with ''Future*''
''Currency'' with ''Exchange'' with ''Option*''
''Currency'' with ''Exchange'' with ''Forward*''
''Currency'' with ''Exchange'' with ''Future*''
''Currency'' with ''Exchange'' with ''Contract*''
''Foreign'' with ''Exchange'' with ''Option*''
''Foreign'' with ''Exchange'' with ''Forward*''
''Foreign'' with ''Exchange'' with ''Future*''
''Foreign'' with ''Exchange'' with ''Contract*''
''Interest'' with ''Rate'' with ''Option*''
''Forward'' with ''Contract*''
''Futures'' with ''Contract*''
''Interest'' with ''Rate'' with ''Cap*''
''Interest'' with ''Rate'' with ''Collar*''
''Fixed'' with ''Rate'' with ''Lock*''
''Forward'' with ''Treasury'' with ''Lock*''

***** Indicates a wildcard search option
Source: Nelson et al, (2005), p879-880

Appendix 2.3: Definition of variables

This table provides the definitions of the variables that were used throughout the regressions. All variables are measured at the end of each fiscal year. All accounting items are denominated in UK pound sterling.

Variables		Definitions
Panel A: Financial and accounting variables		
Agency costs	Asset turnover	The ratio of sales to total assets
Asymmetry information	Earnings surprises	Current EPS less previous EPS/current stock price
Capital expenditure	CAPX	Capital expenditure divided by total assets
Cash-flow	Cash_flow	Ratio of pre-tax profit plus depreciation to total assets
Cash-holdings	Cash	The ratio of cash and marketable securities to total assets
Dividend dummy	Div_dummy	Value of 1 if firm paid dividend and 0 if otherwise
Dividend pay-out	Dividend_pay-out	The ratio of cash dividend to total assets
Firm size	Size	Natural logarithm of total assets in 2004 retail price index
KZ-Index	KZ_Index	-1.002 x Cash-flow + 0.283 x Q + 3.139 x Leverage + -39.368 x Dividend_payouts – 1.315 x Cash
Leverage	Lev	Ratio of total debt to total assets
Market to book	MKT	Ratio of the book value of assets minus book value of equity plus market value of equity to the book value of assets
Profitability	Profitability	Ratio of earnings before interest and tax to total assets
Tangibility ratio	Tangibility	Ratio of net property, plant and equipment to total assets
Tax liability	Tax	The ratio of total tax expenses in a financial year to the firm's total assets
Quick ratio	Quick_ratio	Current assets less inventories divide by current liabilities
Z-score	Z-score	$3.20 + 12.18X_1 + 2.50X_2 – 10.68X_3 + 0.024X_4$. Where X_1 is the ratio of pre-tax profit to current liabilities, X_2 is the ratio of current assets to total liabilities, X_3 is the ratio of current liabilities to total assets and X_4 is the number of credit intervals measured by quick assets less current liabilities, all divided by total sales less pre-tax profit less depreciation, divided by 365.
Panel B: Ownership structure variables		
Board of directors' ownerships	Board_Owners	Percentage of executive and non-executive directors' shareholdings
CEOs and CFOs holdings	CEO_CFO	Percentage of shares held by CEOs and CFOs

Executive shareholdings	Exec_Owners	Percentage of shares held by executive directors
Grey institutions	Grey_Owners	Percentage of shares held by grey institutional investors (banks, trusts, insurance companies and other institutions such as pension fund, foundations and endowments)
Independent institutions	Indep_Owners	Percentage of shares held by independent institutional investors (investment advisors, mutual funds and hedge funds)
Non-executive shareholdings	Non_Exec_Owners	Percentage of shares held by non-executive members of the board
Other executive shareholdings	Other_Exec_Owners	Percentage of shares held by executives other than CEOs and CFOs
Total institutional shareholdings	TOT_Ins_Owners	Percentage of shares held by all institutional investors
Panel C: Hedging, market and business risks variables		
Cash-flow volatility	Cash_flow_vol	Standard deviation of cash flow ratio
Commodity derivatives Users	Commodity_users	Takes the value of 1 if a firm hedges with commodity derivatives
Corporate hedging	Der_Usage	Value of 1 if firm reports use of foreign currency, interest rate and commodity derivatives for hedging purpose and 0 if otherwise
Foreign exchange derivatives users	FOREX_suers	Takes the value of 1 if a firm hedges with foreign currency derivatives
Foreign exchange exposure	FOREX_dummy	Dummy variable that equals one if a firm reports import/export activities, foreign operations and, or foreign tax and zero if otherwise
Geographical diversification	GEO_Divers	Dummy variable that takes 1 if a firm reports having more than one geographical segment.
Industry-wise diversification	Ind_Divers	Value of 1 if firm has more than one business segment
Interest rate derivatives users	Interest_rate_users	Takes the value of 1 if a firm hedges with interest rate derivatives
Interest rate exposure	Interest_cover	The ratio of EBIT to interest expenses
Panel D: Other variables		
Industry effect	Ind_dummy	DataStream industry classification code
Time effect	Time_dummy	Dummies ranges from 1 to 7
Macroeconomic dummies	Macroeconomic dummies	Pre-crisis period (2005-2007) equals 1, During a financial crisis periods (2008-2009) equals 2 and post-crisis periods equals 3.

Appendix 2.4: Pairwise correlation matrix

Pairwise correlations are estimated on the pooled dataset. The sample consists of yearly observations from 2005 to 2011 for a sample of UK non-financial firms. This table presents the pairwise correlation matrices between each variable. Definitions of variables are presented in Appendix 2.3. * Connotes significant level of 5%.

	Market to book	Tax	Assets utilisation	Earnings surprises	Intangibility	Interest cover	Liquidity	Cash-flow volatility	KZ-index	Board owners	Non exec owners	Executive owners
Market to book	1.0000											
Tax	**0.1753***	1.0000										
Assets utilisation	-0.0343	**0.2410***	1.0000									
Earnings surprises	-0.0336	-0.0384	-0.0248	1.0000								
Intangibility	**-0.0889***	**-0.0880***	**-0.2531***	-0.0438	1.0000							
Interest cover	**0.1552***	**0.4461***	**0.1730***	0.0294	**-0.1358***	1.0000						
Liquidity	**0.2305***	-0.0337	**-0.1733***	0.0359	**-0.2675***	**0.1175***	1.0000					
Cash-flow volatility	**0.1459***	**-0.3641***	**-0.1358***	0.0267	-0.0374	**-0.3083***	**0.1522***	1.0000				
KZ-index	**-0.1481***	**-0.4050***	**-0.2537***	0.0141	**0.191**6*	**-0.3529***	**-0.2041***	**0.0850***	1.0000			
Board owners	**0.0650***	**-0.0495***	**0.1298***	0.0407	-0.0391	-0.0133	**0.0480***	**0.1139***	**0.0593***	1.0000		
Non exec owners	-0.0008	-0.0444	**0.0675***	0.0098	0.0096	**-0.0741***	0.0318	**0.0975***	**0.0493***	**0.7078***	1.0000	
Executive owners	**0.1001***	-0.0435	**0.0999***	0.0436	-0.0329	0.0181	0.0398	**0.0968***	0.0341	**0.7676***	**0.1705***	1.0000
CEO_CFO	**0.0920***	-0.0447	**0.0725***	**0.0499***	**-0.0529***	-0.0085	0.0103	**0.1041***	**0.0655***	**0.6773***	**0.1531***	**0.8468***
Other executives	0.0348	-0.0259	**0.0505***	-0.0077	**0.0614***	-0.0213	0.0206	**0.0648***	-0.0181	**0.4435***	**0.2951***	**0.5822***
Institutional owners	0.0422	**0.1220***	0.0040	**-0.0717***	**0.1871***	0.0156	**-0.1128***	**-0.1980***	**-0.1254***	**-0.3720***	**-0.2242***	**-0.2368***
Independent owners	0.0423	**0.1448***	0.0196	**-0.0676***	**0.1584***	0.0304	**-0.0995***	**-0.2070***	**-0.1472***	**-0.3513***	**-0.2068***	**-0.2211***
Grey owners	0.0320	**-0.1022***	**-0.0519***	-0.0273	**0.1573***	**-0.1306***	**-0.0515***	**0.0494***	**0.1040***	-0.0105	**0.0676***	**0.0484***
Hedging dummy	**-0.2061***	**0.2270***	**0.0918***	**-0.0648***	**0.0813***	**0.0861***	**-0.2346***	**-0.2806***	**-0.0656***	**-0.2590***	**-0.1569***	**-0.2240***
Tangibility	**-0.1575***	**0.0764***	**-0.1127***	0.0198	**-0.3819***	-0.0214	**-0.2420***	**-0.1557***	**0.1174***	**-0.0771***	-0.0404	**-0.0846***
Leverage	**-0.1849***	-0.0361	**-0.1377***	-0.0404	**0.1611***	**-0.2386***	**-0.4024***	**-0.0898***	**0.4571***	**-0.0633***	-0.0134	**-0.0745***
CPX	**0.1562***	**0.1739***	0.0360	-0.0127	**-0.3413***	**0.0672***	**-0.1096***	**-0.0681***	0.0021	**-0.0984***	**-0.1013***	**-0.0523***
Dividend pay-out	**0.2969***	**0.4885***	**0.1968***	**-0.0999***	**-0.0735***	**0.2760***	-0.0221	**-0.1733***	**-0.6157***	**-0.0779***	**-0.0607***	**-0.0628***
Firm size	**-0.2863***	**0.2564***	-0.0265	**-0.0664***	**0.0916***	**0.1057***	**-0.2847***	**-0.4338***	**-0.0545***	**-0.4177***	**-0.2382***	**-0.3576***

Appendix 2.4 continues

	CEO_CFO	Other executives	Institutional owners	Independent owners	Grey owners	Hedging dummy	Tangibility	Leverage	CPX	Dividend pay-out	Firm size
CEO_CFO	1.0000										
Other executives	**0.2334***	1.0000									
Institutional owners	**-0.2393***	-0.0064	1.0000								
Independent owners	**-0.2278***	0.0104	0.9833*	1.0000							
Grey owners	**0.1176***	**0.2038***	0.3420*	**0.2490***	1.0000						
Hedging dummy	**-0.2137***	**-0.1081***	**0.3978***	**0.3975***	0.0259	1.0000					
Tangibility	-0.0380	**-0.0963***	-0.0031	0.0001	-0.0355	**0.1650***	1.0000				
Leverage	-0.0435	**-0.0502***	**0.1783***	**0.1626***	**0.1027***	**0.3263***	**0.2924***	1.0000			
CPX	-0.0265	**-0.0822***	**0.0853***	**0.0940***	-0.0377	**0.1521***	**0.5902***	**0.1433***	1.0000		
Dividend pay-out	**-0.0651***	-0.0403	**0.2207***	**0.2280***	-0.0215	**0.2178***	**0.0474***	0.0337	**0.1407***	1.0000	
Firm size	**-0.3483***	**-0.1477***	**0.5003***	**0.4924***	**0.0612***	**0.5849***	**0.2752***	**0.3308***	**0.1943***	**0.1939***	1.0000

Appendix 2.5: Pooled logistic regressions for derivatives usage decisions

This table presents the marginal effects and robust standard errors from the logistic regressions of the incentives for derivatives usage. The regressions are estimated on the pooled dataset. Panel A provides the results from the logistic regressions of the incentives for derivatives usage for the whole sample period, i.e., observations from 2005 to 2011. Panel B presents the results from the logistic regressions for the pre-financial crisis with sample periods from 2005 to 2007 (columns 3 and 4). Panel C reports the results from the logistic regressions for the financial crisis period with sample periods from 2008 to 2009 (columns 5 and 6) and Panel D reports the results from the logistic regressions for after the financial with sample periods 2010 to 2011 (columns 7and 8). The dependent variable is a dummy variable that takes the value of one if a firm hedges with financial derivative instruments (foreign currency, interest rate and/or commodity) and 0 otherwise. The main variable of interest is the measure of financial distress and its associated costs (KZ-index). Robust standard errors are obtained by clustering at the firm-level and reported in parentheses. *, ** and *** indicate significance at the 10%, 5% and 1% levels respectively. Definitions of other variables are presented in Appendix 2.3.

	Panel A		Panel B		Panel C		Panel D	
	Whole sample period		Pre-crisis		During a financial crisis		After crisis	
Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
KZ-Index	0.0159	0.0168	0.0136	0.0132	0.0222	0.0253	0.0091	0.0128
	(0.0182)	(0.0181)	(0.0190)	(0.0187)	(0.0214)	(0.0212)	(0.0243)	(0.0240)
CAPX	**1.3661***	**1.3390***	**2.1582*****	**2.1350*****	0.8521	0.8400	0.7553	0.7448
	(0.7338)	(0.7319)	(0.8201)	(0.8220)	(0.9166)	(0.9220)	(0.8915)	(0.8819)
Size	**0.1052*****	**0.1045*****	**0.1072*****	**0.1101*****	**0.1103*****	**0.1071*****	**0.0988*****	**0.0955*****
	(0.0132)	(0.0135)	(0.0134)	(0.0139)	(0.0159)	(0.0158)	(0.0168)	(0.0171)
Industry_divers	-0.0244	-0.0249	0.00207	0.0041	-0.0075	-0.0109	-0.0636	-0.0658
	(0.0490)	(0.0490)	(0.0534)	(0.0534)	(0.0579)	(0.0576)	(0.0560)	(0.0553)
Geo_dummy	0.0086	0.0196	0.0190	0.0230	-0.0205	-0.0124	-0.0002	0.0291
	(0.0687)	(0.0662)	(0.0862)	(0.0797)	(0.0746)	(0.0729)	(0.0813)	(0.0818)
FOREX_Exposure	**0.1401****	**0.1293***	**0.1396***	**0.1344***	**0.1493****	**0.1434****	**0.1483***	0.1264
	(0.0692)	(0.0671)	(0.0834)	(0.0787)	(0.0732)	(0.0717)	(0.0791)	(0.0797)
Assets_utilisation	0.0213	0.0212	0.0208	0.0203	0.0205	0.0210	0.0205	0.0193
	(0.0256)	(0.0251)	(0.0260)	(0.0256)	(0.0297)	(0.0293)	(0.0285)	(0.0283)
Intangibility	0.1250	0.1328	0.0706	0.0726	0.1233	0.1315	**0.2121***	**0.2284****
	(0.1004)	(0.1011)	(0.1089)	(0.1092)	(0.1191)	(0.1197)	(0.1160)	(0.1144)
Board_Owners	0.0419		0.0966		0.0223		0.0079	
	(0.103)		(0.1204)		(0.110)		(0.1202)	
Non_Exec_Owners		-0.0364		0.0449		-0.0166		-0.0967
		(0.1272)		(0.1404)		(0.1173)		(0.1369)
CEO_CFO		0.0602		0.1999		-0.0978		0.0133
		(0.1341)		(0.1299)		(0.1616)		(0.1834)

TOT_Ins_Owners	0.0883		0.0938		0.0633		0.0804	
	(0.0774)		(0.0830)		(0.0918)		(0.1063)	
Indep_Owners		0.0882		0.0870		0.0644		0.1023
		(0.0770)		(0.0808)		(0.0895)		(0.1086)
Grey_Owners		-0.0598		0.0213		-0.1314		-0.2586
		(0.1374)		(0.1384)		(0.2021)		(0.2906)
Industry dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	**-18.4893*** **	**-18.3909*** **	**-19.4989*** **	**-19.9800*** **	**-18.4778*** **	**-18.0925*** **	**-17.6942*** **	**-17.3842*** **
	(2.3115)	(2.3400)	(2.5307)	(2.6345)	(2.8319)	(2.8256)	(2.9748)	(2.9811)
Log likelihood	-678.4892	-678.1189	-283.0156	-281.7281	-190.6838	-190.2153	-190.8247	-189.6879
Pseudo R-squared	0.4012	0.4016	0.4285	0.4311	0.4009	0.4023	0.3943	0.3939
Number of observations	1,697	1,697	725	725	485	485	487	487
Number of firms	244	244	244	244	244	244	244	244
Area under the ROC curve	0.8893	0.8895	0.8814	0.8805	0.8853	0.8840	0.8807	0.8793

Appendix 3.1: Estimates of derivatives usage and firm performance – Subsample of firms

This table shows coefficients obtained from pooled OLS estimates for derivative usage, ownership and firm performance based on whether a firm hedges with derivatives or not. The regressions are estimated on the pooled dataset for the whole sample period, i.e., observations from 2005 to 2011. Panel A reports coefficient estimates for derivative users; while Panel B reports coefficient estimates for non-users. Tobin's Q at time *t* is regressed on explanatory and vector variables at time *t-1*. Standard errors are corrected for heteroscedasticity and serial correlation by clustering at firm-level; and they are reported in the parenthesis. Tobin's Q 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 *** indicate significance at the 10%, 5% and 1% levels respectively. Definitions of variables are shown in Appendix 2.3.

Models	Panel A: Subsample of derivative users					Panel B: Subsample of non-users				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Board_Owners	0.2620			0.2605		0.8075			0.8134	
	(0.5066)			(0.5083)		(0.8211)			(0.8361)	
Exec_Owners		-0.137			-0.1385		0.9738			0.9813
		(0.554)			(0.5555)		(1.1091)			(1.1264)
Non_Exec_Owners		0.5578	0.5450		0.5565		0.4769	0.5584		0.4820
		(0.5635)	(0.5646)		(0.5655)		(1.0478)	(1.0585)		(1.0538)
CEO_CFO			-0.5058					1.2412		
			(0.6632)					(1.3470)		
Other_Exec_Owners			0.8635					-0.1571		
			(1.0827)					(1.6448)		
TOT_Ins_Owners	**0.7406****	**0.7539****	**0.7715****			**1.2455****	**1.2191****	**1.2236****		
	(0.3112)	(0.3100)	(0.3106)			(0.5637)	(0.5824)	(0.5830)		
Indep_Owners				**0.7489****	**0.7627****				**1.2322****	**1.2030****
				(0.3031)	(0.3018)				(0.4972)	(0.5199)
Grey_Owners				0.6221	0.6281				1.3944	1.3889
				(1.0650)	(1.0704)				(2.4141)	(2.4200)
Leverage	**-1.9190*****	**-1.9512*****	**-1.9311*****	**-1.9166*****	**-1.9487*****	-1.5109	-1.5174	-1.5566	-1.5129	-1.5197
	(0.5099)	(0.5004)	(0.4932)	(0.5078)	(0.4981)	(1.4059)	(1.4404)	(1.4476)	(1.4097)	(1.4448)
SIZE	-0.0146	-0.0212	-0.0252	-0.0142	-0.0208	**-0.2964*****	**-0.2911*****	**-0.2873*****	**-0.2960*****	**-0.2906*****
	(0.0344)	(0.0353)	(0.0349)	(0.0355)	(0.0365)	(0.0807)	(0.0821)	(0.0823)	(0.0830)	(0.0847)
CAPX	**2.9480*****	**2.9521*****	**3.0420*****	**2.9407*****	**2.9444*****	**3.8406****	**3.7001****	**3.5549***	**3.8422****	**3.7021****
	(0.9983)	(1.0013)	(1.0138)	(1.0063)	(1.0086)	(1.7056)	(1.7855)	(1.8091)	(1.7079)	(1.7878)

Appendix 3.1 continues

Models	Panel A: Subsample of derivative users					Panel B: Subsample of non-users				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Div_dummy	-0.0918	-0.0902	-0.0914	-0.0933	-0.0918	-0.5224	-0.5251	-0.5445	-0.5220	-0.5246
	(0.232)	(0.2312)	(0.2298)	(0.2301)	(0.2294)	(0.3673)	(0.3709)	(0.3823)	(0.3653)	(0.3689)
Geo_dummy	0.0380	0.0223	0.0346	0.0369	0.0210	**0.5585***	**0.5696***	**0.5537***	**0.5600***	**0.5612***
	(0.1765)	(0.1789)	(0.1811)	(0.1775)	(0.1799)	(0.3076)	(0.3076)	(0.3068)	(0.3132)	(0.3133)
Ind_divers	0.0588	0.0544	0.0433	0.0592	0.0548	0.0614	0.0570	0.0678	0.0584	0.0536
	(0.1485)	(0.1492)	(0.1486)	(0.1491)	(0.1598)	(0.4167)	(0.4159)	(0.4144)	(0.4122)	(0.4116)
Ind_dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time_dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	**2.0022*****	**2.1423*****	**2.2008*****	**1.9964*****	**2.1362*****	**6.4906*****	**6.4159*****	**6.3763*****	**6.4817*****	**6.4055*****
	(0.6940)	(0.7201)	(0.7119)	(0.7054)	(0.7318)	(1.5725)	(1.6005)	(1.6162)	(1.6248)	(1.6563)
Number of observations	583	583	583	583	583	364	364	364	364	364
Number of firms	144	144	144	144	144	89	89	89	89	89
R-squared	0.2518	0.2546	0.2575	0.2518	0.2547	0.2322	0.2327	0.2341	0.2322	0.2328

Appendix 4.1: Estimates of Leverage models

In this table, we report results from the estimations of the basic model used to predict optimal leverage:

$$LEV_{it} = \alpha_0 + \beta_1 LEV_{it-1} + \beta_2 PROFIT_{it} + \beta_3 SIZE_{it} + \beta_4 GROWTH_{it} + \beta_5 TANG_{it} + \nu_{it} + \varepsilon_{it}$$

LEV is the ratio of total debt to total assets. Profitability is the ratio of EBIT to total assets. SIZE is the natural logarithm of total assets in 1991 RPI. Growth is the ratio of total assets minus book value of equity plus the market value of equity to total assets. Tangibility is the ratio of fixed assets to total assets. The estimates are obtained using two-step DIFF-GMM estimator (Roodman 2009) with the Stata module xtabond2 in model (1) and SYS-GMM estimator (Blundell-Bond 1998) with Stata module xtdpd in model (2). Standard errors are reported in ( ) and p-values of statistics are reported in [ ]. The signs ***, **, and * represent significance at the 1%, 5% and 10% levels respectively, and are in boldface.

Independent variables	(1)	(2)
Lagged Leverage	**0.7791*** **	**0.4226*** **
	(0.0789)	(0.0007)
Profitability	**-0.1579*** **	**-0.0498*** **
	(0.0400)	(0.0002)
Size	**0.0220** **	**0.0149*** **
	(0.0101)	(0.0001)
Growth	0.0011	**-0.0148*** **
	(0.0073)	(0.0001)
Tangibility	**0.1535***	**0.0500*** **
	(0.0821)	(0.0017)
Time Dummies	Yes	Yes
Constant	**-0.4124** **	**-0.1629*** **
	(0.1898)	(0.0016)
AR(2) test	1.350[0.178]	1.0173 [0.3090]
Sargan test	8.4500[0.5850]	184.4012 [0.8688]
Observations	2,086	2,086
Number of firms	244	244