

**THE DETERMINANTS OF THE FIXED AND FLOATING
RATE DEBT. A CASE FOR UK NON-FINANCIAL FIRMS.**

**A thesis submitted to Middlesex University in partial fulfilment of
the requirements for the degree of Doctor of Philosophy**

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Dedication

This piece of work is completely dedicated to Ramsamy Appadu, who's last few words before he passed away, was to advise me to study. These words are kept to encourage me and inspired me to begin and Complete this study.

ABSTRACT

This thesis attempts to find the determinants of the fixed and floating rate debt mix by using a comprehensive dataset of UK non financial firms. The UK provides a particularly valuable for empirical investigation since it has a large and sophisticated corporate sector. Additionally UK firms have become more exposed to different types of risk because of the increasing level of debts commitments, expanding to international operations. Lack of consensus of the economic effects of the fixed and floating rate debt mix decision as well as the limited research on this issue in the UK intrigued the author and led to this research into whether the UK evidence enhance the theories of capital structure .In this way the thesis contributes to the ongoing debate in the literature and provides a valuable additional case study. The thesis also contributes by giving insights into the determinants of the fixed and floating debt mix across firms over a period of time (1999-2004). One of the main contributions of this study is that the evidence presented suggests that the fixed and floating rate debt are heterogeneous when the determinants of the capital structure is examined. Also firms are mainly hedging when determining the floating rate debt. Firms considering foreign debt and floating rate debt are mainly using foreign currency derivatives to hedge their exchange rate risk. In undertaking this analysis, a systematic empirical approach is taken which employs essentially the econometric methodologies by using the panel data.

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List of Acronyms

CAPM- Capital Asset Pricing Model

CEO- Chief Executive Officer

CFO- Chief Financial Officer

CRSP-Centre of Research Security Prices

FRS- Financial Reporting Statement

FTSE- Financial Times Stock Exchange

IV- Instrumental Variable

LIBOR-London Inter-Bank Offer Rate

LM- Lagrange Multiplier

LSDV- Least Square Dummy Variable

MM – Modigliani and Miller

MTBV-Market to Book Value

MV- Market Value of Equity

NPV- Net Present Value

OLS- ordinary Least Squares

POT- Pecking Order Theory

ROI- Return on Investment

SDC-Securities and Data Company

UK- United Kingdom

USA- United States of America

Chapter 1: Introduction of the determinants of fixed and floating debt: New Empirical Evidence from UK Non-Financial Firms.

1.1. Introduction

This chapter provides an overview of the framework of the thesis. It begins with a critical evaluation of the research on capital structure and the fixed and floating rate debt mix. It also provides the aims and objectives of this research. Following the aims and objectives, the research rationale for this thesis that the researcher attempts to address is undertaken. Finally, the chapter provides an overview of the structure of the thesis and the key issues investors and researchers face in corporate finance.

1.2. Research background

In a perfect and fully integrated capital market, Modigliani and Miller (1958, 1963) demonstrated that a firm's value is independent of its capital structure. Their main finding was that the rewards for bearing relevant risks should be the same across securities. They showed that if a levered and an unlevered firm are in the same risk class and they have identical cash flows, arbitrage opportunities make the market values of the levered and unlevered firm equal. With respect to security issuance, their propositions implied that there should be no gain from switching between debt and equity.

Stiglitz (1972) extended the argument of Modigliani and Miller's theorem. He showed that changes in maturity do not add value to the present set of investment opportunities available.

This theorem is based on a frictionless market with no tax or bankruptcy costs. These classic models showed that in a perfect market with no frictions, the debt-equity choice is of no consequence and the debt maturity choice is also not relevant for value-maximizing financial managers. However, if the strict assumptions of frictionless markets are relaxed, changes in debt-equity choice affect the firm's value. (Chang and Yu, 2008; Easley and O'Hara, 2004)

This research attempts to look into the depth of the composition of debt that firms use. Debt in itself comprises a mix of both short and long term maturity. Short term debts are normally debt maturing within one year, whereas long term debts have a maturity greater than one year. Research on the types of debt evidenced that firms which have heavy debt users rely on long term debt financing (Andrew, 1993). In terms of source of debt financing, firms with short term debt rely mainly on bank financing, as access to capital markets can be a lengthy and costly process. Banks are usually more willing to provide the needed financing because non-financial firms have collateral in terms of fixed assets to lend against loans. Because firms rely on high amounts of debt financing, interest rate risk represents the most significant source of market risk exposure for firms.

Similar to short term and long term debt financing, firms face the volatility of both interest rates and cash flow when they rely mainly on floating rate debt. Thus, when interest rates change, firms expect their interest costs to change which can affect expected earnings of firms. Taken together, a firm's financial performance is mainly affected when it has more floating rate debt. One common practice in corporate finance is to consider the percentage of fixed rate or floating rate debt that a firm issues. The percentage of fixed or floating rate debt varies from firm to firm. A firm can have different strategies when choosing the floating debt. It can have 100% of floating rate debt or zero floating rate debt, or a mix of fixed and floating

rate debt. When total debt issuance leans more towards one type of debt, this might signal the company's view on interest rates. When firms issue fixed rate debt, for example, 50% or more of the total debt, this gives an indication that interest rates are likely to rise (Brobst and Huang, 2002). Alternatively, when the percentage of floating rate debt issued is more than 50% of total debt, this indicates that firms expect interest rates to decline. Finally, a 50:50 mix is often considered a neutral interest rate position.

1.3: Research rationale

The corporate finance literature abounds with examples of studies that investigate the choice between debt and equity; that is, the determinants of capital structure (Graham and Harvey, 2001; Ozkan, 2001; Lasfer, 1995; Antoniou et al., 2008; Ang 1991; Muradoglu et al., 2009). Researchers have also investigated related issues such as the determinants of debt maturity (Barclay and Smith, 1995). Recently, research has examined the use of foreign currency debt (Allayannis and Ofek, 2001; Elliott, Huffman and Makar, 2003; Kedia and Mozumdar, 2003; Allayannis, Brown and Klapper, 2003). However, an issue that has received limited attention in the corporate finance literature is the determinants of fixed and floating debt mix. Debt in itself can affect the earnings and cash flows of firms. Moreover, when considering the floating rate debt which is more volatile as compared to fixed rate debt firms' cash flows and earnings are more likely to be volatile. Thus, the decision of the fixed and floating rate debt is also a risk management decision made by firms with significant valuation implications.

The interest rate structure of the debt of a firm can have a significant effect on its financial performance. If interest rates were to increase sharply, corporate liquidity could be adversely affected. The degree to which a firm is affected by interest rate changes is related to the interest rate mix of its debt. Clark and Judge (2003) found that there is considerable cross-

sectional variation in the mix of fixed and floating rate debt in the top 100 UK firms. In some instances, firms have either 0% or 100% fixed; however, the majority maintain a mix of fixed and floating debt. These choices are mainly discussed by financial managers to maintain the level of cost of debt for firms. The issues which drive firms to choose floating rate debt or fixed rate debt is one of the main questions that the researcher attempts to address in this study. Therefore, an understanding of the degree to which type of debt is decided on for a firm is an important factor to derive the value of the firm.

According to the trade-off theory of capital structure, Leland (1994) considered a single class of debt (only fixed debt)¹. Research in the area of capital structure and corporate debt are exclusively represented by fixed coupon bonds (Leland and Toft, 1996; Mello and Parsons, 1992; Leland, 1998; Fan and Sundaresan, 2000; Goldstein *et al.*, 2001; Miao, 2002; Morellec, 2004). A large body of agency-based theoretical research in corporate finance argued that corporate capital structure should include multiple types of debt (for example, Diamond, 1993; Park, 2000; Bolton and Freixas, 2000; DeMarzo and Fishman, 2007). The majority of empirical research continues to treat debt as uniform. These researchers focused on the equity versus debt decision, but remained silent with respect to the optimal allocation to various types of debt instrument (fixed or floating rate debt). There are few studies in the literature regarding fixed and floating debt and therefore this leaves consideration of the optimal allocation to various classes of debt instrument. One notable exception is presented in a recent paper by Hackbarth *et al.* (2007), where the authors examined the optimal mix of bank and market debt, but assumed a single class of (fixed rate) bonds as far as market debt is concerned. In determining the capital structure, Rauh and Sufi (2008) showed the importance

¹ See also Brennan and Schwartz (1978), who were the first to use the contingent-claims analysis approach of Black and Scholes (1973), Merton (1974), and Black and Cox (1976) in the analysis of capital structure decisions.

of recognizing debt heterogeneity in capital structure studies. They classify debt into bank debt, straight bond debt, convertible bond debt, program debt (such as commercial paper), mortgage debt, and all other debt, but failed to consider whether there was any heterogeneity for fixed and floating rate debt. Thus, this research attempts to analyse the debt structure (fixed and floating rate debt) and capital structure.

The majority of studies on fixed and floating debt mix are concentrated in the USA (Chava and Purnanandam, 2007; Vickery, 2008; Faulkender, 2005; Covitz and Sharp, 2006); the remaining studies are from Sweden (Rokkanen, 2007) and the UK (Antoniou *et al.*, 2009). These studies attempt to determine the choice between the fixed and floating debt mix

A comprehensive study by Faulkender (2005) concluded that chemical firms are timing the market and tend to have more floating rate debt. Chava and Purnanandam (2007) found that firm size and growth opportunity are the main factors that determine the structure of debt. These conclusions are still acceptable or even valid. This, however, implies that the deciding choice between fixed and floating rate debt may have a different impact on different types of firms (small or large) in different countries or in different industries.

Several factors contribute to the deciding choice of fixed and floating debt, discussed in this research. These include: natural hedging market timing, and other financial characteristics such as firm size, financial distress, underinvestment costs and source of debt. Too much volatility in interest rates definitely affects cash flow and can lead to negative performance, which, in turn, can also lead to financial distress. Since there have been a limited number of studies in this area of research, the factors affecting fixed and floating debt are still uncovered in the UK context.

Under the premise that cash flow volatility is costly for firms, hedging theories (see Smith and Stulz, 1985; Froot, Scharfstein, and Stein, 1993) predict that a firm with a positive (negative or zero) correlation between its operating cash flow before interest expenses and interest rates should maintain higher (lower) floating rate debt to avoid the costs associated with low cash flow situations. In particular, hedging theories stipulate that by matching the interest rate exposure of the liabilities to that of their assets, firms can reduce the variability of their cash flow and, as a result, lower their expected costs of financial distress and/or capture a greater tax shield benefit (Smith and Stulz, 1985).

The market timing theory stipulates that debt management decisions are governed by a speculative motive with the focus on lowering the expected cost of debt servicing. According to the market timing view, firms borrow floating rate debt when the perceived cost of borrowing floating rate debt is lower than the fixed rate debt and vice versa. Thus when yield spread (that is, the difference between the long and short term borrowing rate) is higher, firms are more likely to borrow floating rate debt. From the empirical standpoint, Faulkender (2005) finds support for the market timing hypothesis for a sample of chemical firms, while Vickery (2008) fails to support the theory by using a sample of small private firms.

In terms of debt financing, non-financial firms without access to external capital markets have to rely on bank financing for their growth opportunity. Firms access debt finance through the capital markets for mainly long term debts and foreign debts. Banks are usually more willing to provide the needed debt financing to non-financial firms because they have fixed assets in terms of collateral. Thus firms relying on bank based debt have more likelihood of interest rate risk as these debts are at a floating rate. Thus changes in interest rates have the potential to increase cash flow volatility, increase interest expenses, and reduce earnings. Larger sized firms may prefer to secure debt finance from external sources rather

than from banks, as it might be more accessible and cheaper. This may be due to the fact that firms have to build up their own reputation to achieve good credit quality.

Foreign currency debt has been examined by Allayannis and Ofek (2001), Elliott, Huffman and Makar (2003), Kedia and Mozumdar (2003) and Allayannis, Brown and Klapper (2003). More recently, Berospide *et al.* (2008) addressed the issue of foreign debt and domestic debt together with debt capacity. Prior researchers concentrates on foreign debt and very little is explained when it comes to foreign floating rate debt ratio or the currency composition of foreign debt. This research therefore addresses this issue. It also takes into account the currency mix of floating rate debt ratio. As such, the currency mix of UK floating rate debt ratio and other main currencies will be explored thoroughly. The research intends to address the gap of currency mix in floating rate debt ratio in the literature.

1.4: Aims and objectives

Over the last 10 years the corporate finance literature has attracted enormous attention from investors, chief executive officers (CEOs) and chief financial officers (CFOs), raising the question of how much debt a firm should have in the capital structure to sustain growth and to run the business smoothly. Financial managers and CEOs are trying to understand what the main factors are affecting capital structure in the UK and, more importantly, the components of the debt structure: fixed rate debt and floating rate debt. Following the new disclosure requirements from the FRS 13², it is important to discern what drives the choice between

² The disclosure would also typically include a description of the main financial risk management and treasury policies agreed by the directors, including the policies, quantified where appropriate, on:

- a) the fixed/floating split, maturity profile and currency profile of financial assets and financial liabilities;
- b) the extent to which foreign currency financial assets and financial liabilities are hedge to the functional currency of the business unit concerned;
- c) the extent to which foreign currency borrowings and other financial instruments are used to hedge foreign currency net investments; and
- d) any other hedging

fixed and floating rate debt for non-financial firms in the UK. The overall aim of this research is to identify the main determinants of the fixed and floating rate debt mix for UK firms and find what role they play for non-financial firms. The following objectives were generated for this research and hopefully will help to achieve the overall goal. The main objectives of the research are:

- To identify the general determinants of floating rate debt of non-financial firms in the UK.
- To identify the main reasons why firms have foreign debt and foreign floating rate debt and whether foreign exchange hedging has an impact on foreign debt in non-financial UK firms.
- To analyse the effect of the floating rate debt and the effect of firms with and without credit rating.

1.5. Research structure of the thesis and contribution of the thesis

This thesis empirically examines the determinants of the fixed and floating rate debt mix of large non-financial firms in a UK context. It starts with this introductory chapter (Chapter 1). The remaining chapters of the thesis are organised as follows:

1.5.1 Theoretical Overview (Chapter 2)

The theoretical overview of the capital structure, debt to maturity and fixed and floating rate debt are explained in Chapter 2. It explains what drives firms to choose between fixed and floating rate debt. It also shows the relationships of the capital structure theories and fixed

and floating rate debt. The chapter provides an overview of each determinant of the fixed and floating rate debt, followed by the hypothesis that is employed in this study.

1.5.2 Empirical Literature review (Chapter 3)

This chapter explores the empirical studies of the fixed and floating rate debt mix. Prior to 1999, the concept of fixed and floating debt mix was quasi non-existent for outstanding debt. Following the FRS13, this area of research has developed with respect to corporate finance but is far from conclusive. The magnitude of fixed and floating rate debt has become an empirical issue in the USA, in Sweden and to a small extent in the UK (Antoniou *et al.*, 2009). The review of the empirical studies in Chapter 3 suggests that, although numerous studies have attempted to understand and quantify the different characteristics of fixed or floating debt mix, their findings appear to be sensitive to the quality of how they measure the fixed and floating rate debt. This includes outstanding debt, new debt issues or incremental debt. The lack of clarity and consistency in these results highlighted a number of issues as the literature of empirical investigation evolved.

1.5.3 Research Methodology and Sample Data (Chapter 4)

Through reviewing the existing empirical literature which identifies the variables employed, Chapter 4 describes the variables and the respective definitions that this research employs. It explains how the dataset is built to address the factors determining the choice of fixed and floating rate debt. Since the previous research on the choice of fixed and floating rate debt has not received attention for outstanding debt in the UK, this research attempts to find evidence for non-financial firms in the UK. Non-financial firms are taken into account since financial firms already have derivative usage to face any types of risk. The sample includes only large firms with market capitalisation greater than £1000m. The period under

consideration for this research spans from 1999 to 2004. This chapter also outlines the data and disclosure practices in the UK. Sources of information and the development of the dataset employed in this study are also provided, together with a rationale. It also defines the method that is used for the identification of fixed and floating rate debt mix, as well as domestic floating debt and foreign floating rate debt. It provides definitions of all the variables for each determinant and discusses the rationale in using them. The final section of this chapter indicates the number of firms utilising floating rate debt and the amount of debt these firms have. It also displays the interest rate profile of the types of debt involved in firms (fixed, floating and non interest bearing liabilities).

1.5.4: Determinants of Capital Structure and debt structure (Fixed and Floating Debt): new empirical evidence from UK non-financial firms. (Chapter 5)

This chapter attempts to answer the question of heterogeneity of the types of debt by employing a new dataset from UK non-financial firms when determining the capital structure. Chapter 5 follows Lemmon, Roberts, and Zender (2008) but focuses on the fixed and floating rate debt with a firm's credit quality. Firms are said to have a good credit quality if they have credit rating, and a bad credit quality if no credit rating. The focus of credit quality is depicted from the theoretical research in which the quality of firms with access to credit is the primary source of variation driving the optimal capital structure (Diamond, 1993; Bolton and Freixas, 2000). This chapter moves on to explain whether yearly changes in debt are affected by changes in the factors determining the capital structure. Lastly, it separates the debt into fixed and floating to discuss whether the changes in the composition of debt have an impact on a firm's choice of debt. The contribution of this chapter is that there is heterogeneity in the capital structure and that firms consider fixed and floating rate debt have different

expectations. The results moreover depicts that firms with more credit ratings are more likely to consider fixed rate debt and that non rated firms are prefer floating rate debt.

1.5.5: Determinants of fixed and floating debt mix (Chapter 6)

This chapter discusses the empirical examination of the determinants of the floating rate debt ratio of large non-financial firms in the UK. The factors affecting floating rate debt are examined using an unbalanced panel dataset of 2474 company year-observations for the period from 1999 to 2004. The empirical results attempt to find out whether firms are hedging or timing the market in determining the floating rate debt ratio. The empirical estimations detect the statistically and economically significant positive impact on the use of the internal hedging technique (natural hedging) on the floating rate debt ratio of firms studied. These results are robust across different estimation techniques when firms without the use of interest rate swaps are analysed (Interest rate swap is the only measure of external hedging technique which is analysed in this study). This chapter then investigates the impacts of smaller firms within the sample of large firms when analyzing floating rate debt ratios. The principal contribution of this chapter is to provide a fresh insight into the fixed and floating rate debt mix for UK non-financial firms using a novel dataset which has not been covered in the previous empirical studies. It demonstrates that non financial firms in the UK are more likely to hedge their risk than timing the market when choosing floating rate debt ratio. It also shows that firms that debt to maturity and firm size and leverage are also important factors determining the floating rate debt ratio.

1.5.6: Composition of Floating rate debt (Chapter 7)

This chapter examines the impact of debt mix in the sample of UK non-financial firms. In this chapter, the contribution of the research is on the composition of the currency mix of debt and floating rate debt. It shows that the more foreign debt firms' desire, the more there is a reliance on foreign currency derivatives. It also shows that firms with foreign sales, foreign financial assets and of a larger size are more likely to have foreign debt. These results are consistent with Berospide *et al.* (2008). The contribution of the thesis also includes analysis of foreign floating rate debt. The focus of this chapter is to show that firms having foreign floating rate debt also consider foreign sales and foreign financial assets. They also manage their exposure by employing foreign exchange exposure, and also by natural hedges such as cash ratio. It is through the robustness test analysed in this research that confirms that firms with foreign floating rate debt utilise foreign financial assets, foreign sales and foreign derivatives to manage probable fluctuations in interest rates.

1.5.7 Conclusion (Chapter 8)

This chapter concludes the thesis by providing a summary of the findings and the contributions of the thesis to existing literature on the determinants of fixed and floating debt mix. Finally, the limitations of the study and some thoughts for future research are discussed.

Chapter 2: Theories of Capital Structure and the Fixed and Floating debt.

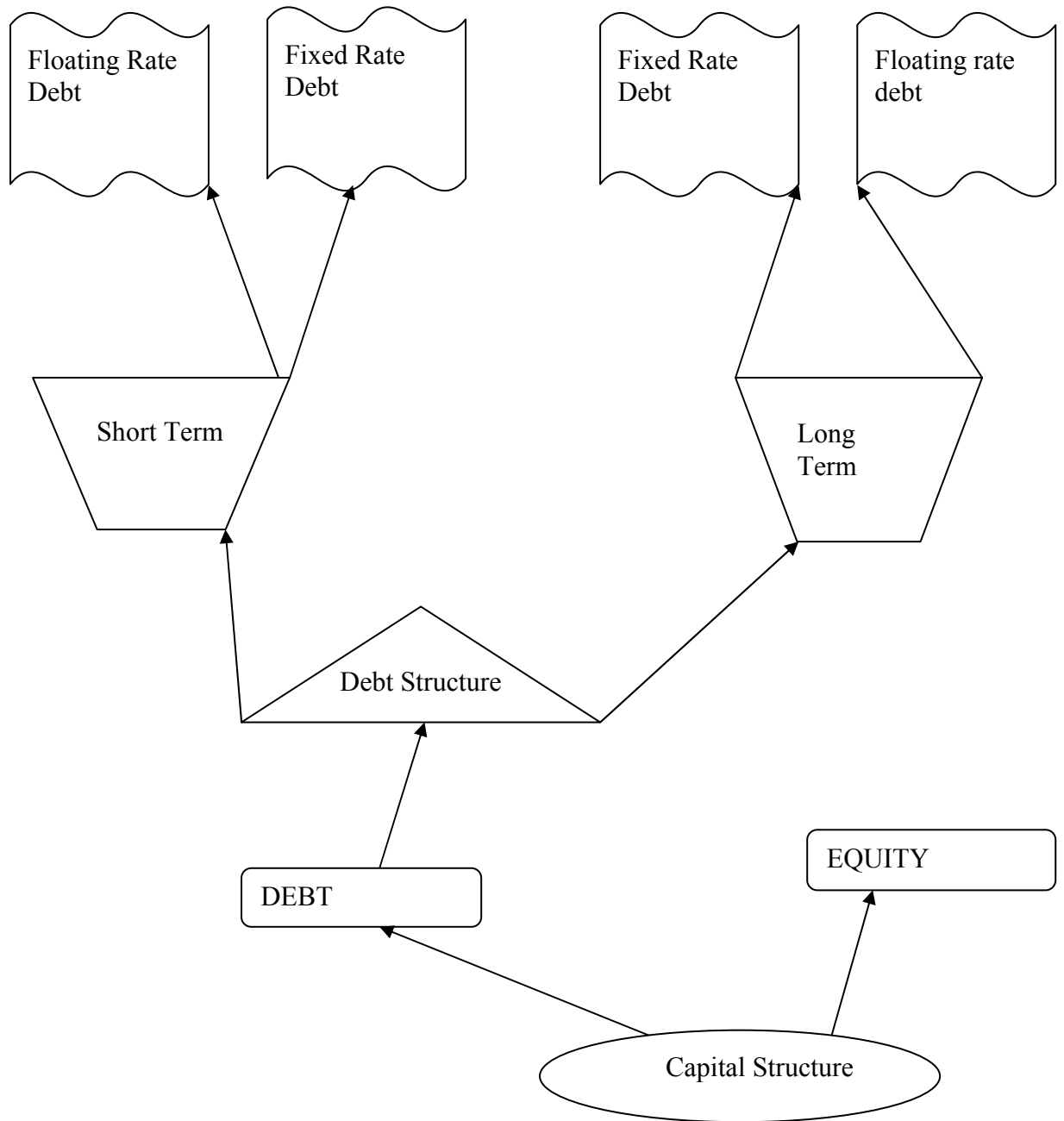
2.1: Introduction

Chapter 2 gives a broad overview of capital structure theory, debt to maturity and their relationship with the choice between the fixed and floating rate debt. An understanding of the underlying choice of the fixed and floating rate debt proves to be an important strategy if financial managers are to maximise the value of the firm. Section 2.2 discusses general capital structure theories which are: the agency theory, the trade-off theory and the information asymmetry theory (signalling theory and Pecking order theory). Section 2.3 discusses the maturity of debt. Section 2.4 discusses fixed and floating debt and their determining factors in conjunction with the theories of capital structure and the hedging theory. Section 2.5 summarises the chapter.

Figure 1 shows the financing decisions of the capital structure. It shows that firms have to decide on which type of debt to choose between fixed or floating rate debt. It also follows that firms having a short term debt to maturity and long term to maturity have both fixed and floating rate debt. It should be noted that firms having short term debt are more prone to floating rate debt than fixed rate debt. However, firms having long term debt are more likely to have fixed rate debt than floating rate debt. This is because firms having long term debt to maturity have a better chance of having access to capital market, therefore, have fixed rate debt whereas firms without access to capital market have to borrow from banks (banks normally lend at a floating rate debt). In determining the amount of debt in the capital structure, financial managers, chief executive officers and stakeholders have to focus on the

debt structure. Such a decision is dependent on different factors such as natural hedge, hedging, market timing, sources of debt, financial distress, profitability and firm size. The relationships between debt structure and these factors are discussed in section 2.4 (p.25) in this chapter.

Figure 1: Flowchart of the capital structure and the fixed and floating rate debt choice



2.2: Capital structure theory

Modern finance theory has its roots in the late 1950's and the early 1960's, as many of the developments in finance have been inspired by the Modigliani and Miller (1958) theorem of capital structure, and the work on the capital asset pricing model (CAPM) by Sharpe (1964) and Lintner (1965). These models made predictions about a firm's corporate financing policy in a world where markets are perfect. The major assumptions of a perfect market are as follows:

- There are no taxes
- Corporate executives have the same set of information as investors
- There are no transaction costs
- Investors and markets are rational
- The firm's level of investment is fixed
- There are no costs of re-contracting or bankruptcy
- The interests of managers and shareholders are aligned.

Modigliani and Miller's (MM) (1958) proposition-1 states that in a perfect competitive market the value of a firm depends on its operating income and level of business risk. Simply, the value of firm does not relate to its capital structure. Financing and risk management choices will not affect a firm's value if the capital market is perfect. Taxes are neutral, meaning the tax system is unbiased. The tax rate is the same for all tax payers. However, in general, it is assumed that the tax rate is zero. Modigliani and Miller grouped firms into risk class, and a risk class was described as an array of firms, each of which has a matching pattern of earning payoffs. There are no transaction costs, and no institutional restrictions create frictionless capital markets in which every investor can undertake the same financial transactions as a firm. A firm's financial choices do not give any signals to

investors about the firm's financial position. If, on the other hand, leverage can signal the firm's profitability by altering investor beliefs about the firm's payoffs, then its choice would affect investor decisions and the firm's market value. That contradicts MM proposition-1. With respect to the perfect market assumption, investors can form a portfolio with any desired cash flow pattern so there is no need for corporations to design their capital structures in ways that tailor their securities to satisfy these desires. At the start, MM propositions were considered for a firm's debt equity choices but the applications of propositions have since expanded to debt maturity, risk management, mergers and spin-offs. MM proposition-2 states that "a firm's cost of equity is a linear function of the firm's debt to equity ratio. A higher debt-to-equity ratio leads to a higher required return on equity, because of the higher risk involved for equity-holders in a company with debt". This proposition also holds with the assumption of perfect market.

MM proposition-3 focuses on dividend payments and the value of a firm. It states that "under certain conditions, the value of a firm is independent of its dividend policy. When two identical firms belong to same risk class, these firms will have equal market value even if they have different dividend policies".

In order to understand the extensive research on capital structure, the literature can be classified into three categories:

- Agency theories that are focused on diminishing the interest conflict between shareholder and managers.
- Trade-off theory, that focuses on bankruptcy cost and tax shelters.
- The asymmetric information theories and their variations.

2.2.1 Theories based on agency costs

Jensen and Meckling (1976) are the most prominent figures in the domain of research on agency costs. Their model was developed initially with the identification of two types of interest conflict: conflict between managers and shareholders, and conflict between debt holders and shareholders. They suggested that when a manager possesses less than 100% residual claims, this causes conflicts between shareholders and managers. The conflict between debt holder and shareholder may arise when issuance of debt gives greater incentives to the shareholder. More explicitly, debt investment is inclined towards shareholders; if investment yields a high return well above the face value of debt, shareholders capture the gains.

According to Jensen and Meckling (1976), an agency relationship is an agreement between two parties. The “agent” performs certain services on the behalf of the “principal”. The problem of directing an agent to maximize the principal’s welfare is rather common. In this relationship both parties are utility maximized. Therefore, there is a probability that the agent will not always perform its responsibilities to maximize the benefits of the principal. The principal has to restrain this problem by fixing an appropriate level of incentive for the agent and to monitor the agent’s actions (by incurring monitoring costs). The principal incurs a specific cost, the “agency cost”, which can be explained as the sum of the following activities:

- The monitoring of expenditure by the principal
- The bonding of expenditure by the agent
- The residual loss.

The principal incurs monitoring costs to limit the unexpected activities of the agent. Bonding expense can be described thus: “in some conditions it will pay the agent to expend resources

(bonding costs) to guarantee that he will not take certain actions which would harm the principal or to ensure that the principal will be compensated if he does take such actions”(Jensen and Meckling, 1976).

According to Grossman and Hart (1982), the use of debt reduces the conflict between managers and shareholders. Their model shows that managers prefer to invest in lucrative projects and consume perks that are of benefit to them alone. Excessive perks used by managers can lead the firm to bankruptcy. Bankruptcy is costly to managers because they lose benefits, so debt can create an enticement for managers to make better investment decisions and consume fewer perks. Narayanan (1987) brought in a new factor to extend Grossman and Hart’s investigation, which was the use of convertible debt. Harris and Raviv (1999) agree that managers like to continue with the current operation of the firm even when investors prefer liquidation.

The agency cost literature recognises that, in addition to reducing the level of debt, the firm can mitigate the costs of asset substitution and underinvestment by shortening the maturity of debt (Myers, 1977). Since short term debt facilitates the re-pricing of debt, bondholders can quite easily respond to changes in the risk of the firm by adjusting the risk premium. Therefore, firms have an incentive to follow a low risk investment strategy with short term debt to minimise the risk premium. Furthermore, issuers of short term debt face less risk than long term debt. A greater proportion of the benefits arise from the incremental investment accruing to shareholders rather than bondholders; thus, the incentive to underinvest is reduced. Wall (1989) suggests a combination of short term debt and interest rate swaps to allow high risk firms to reduce their agency cost without incurring interest rate risk. The swap protects the firm from changes in market interest rates while allowing the credit risk

component to fluctuate. Therefore, the firm faces the prospect of a hike in its risk premium for any shift towards higher risk investments.³

2.2.2: Trade-off theory

Trade-off theory deals with financial distress and the tax advantage of debt financing. Financial distress indicates a condition when promises to creditors are broken or honoured with difficulty and it can lead to bankruptcy (Brealey, Myers and Allen, 2008). Cost of financial distress depends on the likelihood of distress and the cost of bankruptcy.

According to MM's proposition (2), a firm can have 100% debt in its capital structure for receiving utmost benefit of tax shield. However, firms having capital structure comprising only of debt is risky. Static trade-off theory (Myers and Majluf, 1984) suggests that the optimal leverage ratio of the firm is determined by the trade-off between tax shields with debt financing against higher bankruptcy cost.

Optimal debt ratio varies from firm to firm according to the static trade-off theory. A firm having safe and tangible assets and high taxable income has high debt ratio. Such firms will be in a position to provide collateral for debts such as tangible fixed assets and, in case of default, to avoid bankruptcy. According to trade-off theory, profitable firms take more benefit from the tax shield by debt financing because there are fewer chances for them to go bankrupt, and therefore profitable firms are capable of raising their debt ratio more than less profitable firms.

³ Long and Malitz (1983) present evidence which suggests that firms make short term borrowing decisions independent of long term investment requirements and do not attempt to resolve agency problems by the substitution of short term debt for long term debt.

The management of risk has traditionally focused on actual capital. In particular, actual capital in the form of equity provides a “cushion” for absorbing a firm’s risks⁴. The more the equity means the greater the protection. This is because the providers of equity capital are residual or variable claim holders, and they therefore have a claim on the proceeds of investment after the firm’s prior claims have been met. The size of these prior claims will vary; that is, they may be higher or lower than expected due to unforeseen circumstances at the time the investment was initiated. Prior claims higher than those expected generally imply an adverse outcome giving rise to losses. Knowledge of the source of these losses is not required, since equity protects the firm against all forms of risk.

Decreasing gearing reduces the probability of bankruptcy and thereby reduces the expected costs of bankruptcy. Since bankruptcy costs are borne ex post by creditors (or bond holders), then ex ante, the anticipated expected value will be netted out of the issue price of bonds. It follows that reducing risk or reducing gearing will reduce the expected value of these transactions. A firm could lower the likelihood of bankruptcy by having more liquid assets (for example, cash balances or short term investments) ensuring that funds will be available to pay debt claims⁵. Similarly, lower dividend payments help to avoid financial distress.

2.2.3: Information Asymmetry

One of the assumptions of capital structure is access to relevant information concerning a firm’s future earning prospects. However, this assumption may not be valid as one may argue that managers of a company, such as insiders, have access to information about the expected

⁴ This is achieved by raising additional capital beyond that required for the funding of the physical investment and working capital needed to run the firm. This assurance capital typically takes the form of equity; although debt that is subordinated to customer, contractual claims can sometimes be used. (See Merton (1995))

⁵ The existence of liquid assets can be interpreted as negative debt. Therefore in order to paint a realistic picture of a firm’s debt position its cash position should be accounted for. This is sometimes referred to as net gearing.

future earnings and cash flows of firms that is not readily available to outside investors. This is referred to as asymmetric information.

2.2.3.1: Signalling Theory

Management knows more about the firm than do outside investors. Any change in a company's investment, financing, or dividend decisions can represent a signal to investors concerning the management assessment of expected future returns, and hence, the market value of the company.

New issues can be an event that can be viewed as a signal to the financial market regarding the future prospects of the firm or the future acquisitions planned by the management of the firm. Signals provided by the firm in response to capital structure changes are credible because of the potential bankruptcy cost penalty incurred if the implied future cash flow does not occur. Changes in capital structure may also have a negative stock price response if there is new equity offering. When a firm makes capital structure changes, it must be mindful of the potential signal that the proposed transaction will transmit to the market regarding the firm's current and future earning prospects and the intention of its managers.

2.2.3.2: Pecking Order Theory (POT)

The idea of prioritizing the different sources of finance was initiated by Donaldson (1961) who proposed that firms should prefer internal financing over external financing, and debt to equity. Myers and Majluf (1984) argued that if a firm maintains its liquid financial resources (cash and market securities), issues no new securities, and uses only its available retained earnings for financing new investment, then information disparity can disappear. Myers and Majluf (1984) proposed POT by explaining the effects of information asymmetries between

the insiders and outsiders of a firm. Their model contradicts the MM proposition that all market participants have the same information, and proposes that, due to information costs, managers prefer to finance corporate investment by first tapping fewer agency costly sources. More specifically, they prefer internal financing to external financing.

POT explains why more profitable firms use internal funding and less profitable firms use debt financing due to insufficient internal funds. Unlike the MM theory, POT gives less weight to tax shields in capital structure. Profitable firms with limited investment opportunities work down to low debt ratios. When a firm is in financial deficit, debt ratio goes up, and in surplus it goes down.

2.3: Debt to maturity

Optimal capital structure refers not only to the ratio of debt to equity but also to the maturity structure of debt. What portion of debt should be short term and what portion should be long term? Should the firm use a variable rate or a fixed rate? Should long-term bonds pay annual coupons with an inflated payment, or should they be fully amortised (equal periodic payments)?

There are different approaches to answering the maturity structure problem.

A cross-hedging argument by Morris (1976) suggested that short term debt or variable rate debt can reduce the risk of shareholders and thereby increase equity value, if the covariance between net operating income and expected future interest rate is positive. This cross-hedging argument is based on the assumption that unexpected changes in interest rates are a priced factor in the arbitrage pricing model. It does not rely directly on bankruptcy costs or on interest tax shields. However, the argument for cross-hedging is only strengthened if it

increases debt capacity by reducing the risk of bankruptcy and thereby allowing a greater gain from leverage. Smith and Stulz (1985) support this point of view.

An approach to optimal debt to maturity is based on agency costs. Myers (1977) and Barnea, Haugen and Senbet (1980) argued that if shareholders have a claim on the assets of a leveraged firm, it is similar to a call option; then shareholders have an incentive to undertake riskier (higher variance) projects because their call option is greater when the assets of the firm have higher variance. If a firm with long term outstanding risky debt undertakes positive net present value (NPV) projects, shareholders will not be able to capture the full benefits because part of the value goes to debt holders in the form of a reduction in the probability of default. Short term debt may alleviate this problem because the debt may become due before the firm decides to invest. Hence, the theory suggests that firms with many investment opportunities that generate higher growth may prefer to use short term debt.

Another approach to debt to maturity is the liquidity risk argument. Diamond (1991) suggested that the risk of not being able to finance (that is, roll over) short term debt causes firms to seek longer maturity obligations. Banks will, however, supply this demand only for higher quality firms that have higher bond ratings. Consistent with this is the work of Brick and David (1985) who provided a tax based explanation. Miller (1977) suggested that when the term structure of interest rates is not flat and there is a gain to leverage, then long term maturity is optimal, as coupons on long term bonds are currently higher than coupons on short term bonds and the tax benefit of debt (gain to leverage) is accelerated.

This last approach is concerned with the asymmetric information arguments proposed by Flannery (1986), Kale and Noe (1990), and Diamond (1991). They posited that a firm with prospects more favourable than the market expects will choose short term debt over long term

debt. Their reasoning is that when, in the course of events, good news is revealed to the market, short term debt can be refinanced on favourable terms.

Finally, there are the tax arguments as suggested by Brick and Palmon, (1992). Long term debt becomes more favourable when interest rates are volatile and when the firm expects to have a stream of taxable earnings. This is possible as any increase in the volatility of interest rates reduces the present value of tax shields on short term debt. Rates on overnight debt are adjusted so that they always equal the market value. In contrast, if interest rates fall and the firm holds long term debt, it can be refinanced (called) at the option of the firm, and if interest rates rise, the firm can stand put.

2.4: Fixed and floating rate debt

The introduction of the FRS13 in the UK leads firms to the legal obligation of disclosing both the level of outstanding fixed and floating rate debt. Firms are also required to disclose the denomination of the currencies in which they are operating. There are different views regarding how much fixed and floating rate debt a firm should maintain. Certain firms maintain 100% of fixed and others maintain 0% of fixed (Clark and Judge, 2003). Moreover, firms can maintain a mixture of both fixed and floating rate debt. This section attempts to determine the factors that can help financial managers to choose between fixed and floating rate debt. These factors can help a firm to benefit from choosing the appropriate type of debt. The choice of the type of debt varies across firms and depends on the following characteristics:

- Natural Hedging
- Hedging Benefits

-
- Market timing
 - Sources of debt
 - Profitability
 - Financial Distress
 - Firm size.

2.4.1: Natural Hedge

In a situation where interest rates fluctuate, firms can achieve more floating rate debt by the natural hedge. This can be dealt if appropriate techniques are employed by financial managers. Firms can minimise their risk of interest rates through smoothing, matching and netting. Firms try to maintain a certain balance between its fixed and floating rate borrowing. The portfolio of fixed and floating rate debts provides a natural hedge against changes in interest rates. This is so called smoothing. Moreover, firms can also match their assets and liabilities to a common interest rate. If a company borrows to finance an investment receiving a floating interest rate, the loan will be taken at the floating interest rate. Firms can also aggregate all positions, both assets and liabilities, to determine the net exposure.

Another technique employed by Chava and Purnanandam (2007) is correlating profit before interest and tax and interest rate. In a situation where the correlation is positive, a firm can rely on floating rate debt. A firm's earnings remain the same when the correlation between profit before interest and tax and interest rate is positive. This is due to the fact that when profit before interest and tax increases, and interest expense increases, both increase of profit and interest expense offset each other, leading to a natural hedge. Thus, there is stability in a firm's cash flow.

Firms usually have different environments in which they operate. Those operating in the financial sector are fully employing risk management techniques to hedge both their interest rate risk and foreign exchange rate risk. However, firms operating in industries other than finance are not likely to hedge their interest rate risk through derivatives. They can, therefore, employ their own strategy to hedge the fluctuations in interest rates naturally. When there is a positive relationship between interest rates and operating income, firms adopt a floating rate debt (Faulkender, 2005). Hence, when there is an overall rise in interest rates, it would be fair to have a rise in sales leading to an increase in profits before interest and tax. A rise in both interest rates and operating profit will offset the increase, thus stabilising the cash flow (Ross, 1995). However, when general interest rates fall, the corresponding sales decrease will be offset to some degree by lowering the interest expense, thus, stabilising cash flow.

Internal funds available for future investments are called a firm's cash holdings. The pecking order theory shows that firms who have access to internal funds are less likely to opt for external funds. In order to finance investments, managers use cash holdings or external funds (debt), which can alert stakeholders (Jensen, 1986). Firms can internally finance their investments first, according to the pecking order theory. For instance, firms prefer to use their internal cash holdings to external debts which is accompanied by a cost (interest costs). When such a decision is made, firms prefer floating rate debt, as interest rates of debt which is not utilised will not affect the earnings of the firm.

2.4.2: Fixed and floating rate debt and hedging.

The volatility of interest rates can impact a firm's earnings. Therefore, an assessment of the choice of debt structure is important for a firm's finance strategy. Firms can reduce the risk of interest rates by hedging, and having the right instruments, such as the use of derivatives, can counteract an increase in interest rates. Interest rate agreements, particularly swaps, can initially be used by issuers of new debt. Ross (1994) maintains that a company could suffer when interest rates go up and would gain on interest income. To do this, a firm has to swap a reasonable amount so as to offset the effect of interest rates on operating cash flow.

Interest rate swaps permit a borrower to lower the cost of capital by taking advantage of the differences in various financial markets. For example, a borrower could issue debt in the market in which it enjoys a comparable advantage (for example, a fixed rate market) and then swap into the desired form of debt (floating rate debt). The combination of the debt and swap should produce an interest cost that is lower than that possible through a direct issuance in the desired market. When borrowers have a high credit rating, it means that they have the ability to issue fixed rate debt with favourable terms. At that point in time borrowers may wish to issue floating rate debt, but at the same time take favourable credit in the fixed rate market. Accordingly, the borrower issues fixed rate debt at a relatively low rate (say 8%), and enters into a swap in which it makes floating payments tied to LIBOR, and receives fixed payments based on the general market rate at the time of the issuance (say 9%). The effect of the debt/swap package is that the borrower has obtained floating rate debt at a cost (one percentage point below LIBOR) that could not be obtained directly.

The same principles could be used to enhance the yield on investment assets. An investor, for example, plans to purchase a floating rate asset but would like to lock in the higher yields that

are currently available in the fixed rate market. Such an investor could purchase the asset and simultaneously enter into a swap in which it pays floating rate and receives higher fixed rate payments. Thus, it can be deduced that firms having derivatives can swap from fixed rate debt to floating rate debt.

2.4.3: Market timing and fixed and floating rate debt

The choice between fixed and floating rate debt may be driven by firms trying to time the market. Speculation or market timing is the process by which a treasurer predicts the direction of the market through the use of technical indicators or economic data with a view to generate profits. Thus, the CFO can also time the market with the view to reduce the cost of capital. The term structure of interest rates is a key element when examining the choice of fixed and floating rate mix. It is a graphic representation of how interest rates vary with different levels of maturity. That is, it shows the relationship between the yield from a financial instrument and its maturity. Yields across different outstanding maturities can be plotted to create a yield curve. Thus, when the yield spread, which is the difference between the long term rate and the short term rate, has an increasing trend, according to a general market timing view, firms are more likely to borrow floating rate debt to reduce their short term cost of capital. When the yield spread flattens, that is, deteriorates in the expected economic conditions, firms are less likely to have floating rate debt.

Longstaff and Schwartz (1995) derived a model whereby they considered the valuation of floating rate and fixed rate debt and in which both the default of risky debt and interest rates were taken into consideration. It was found that in the short term, fixed payments were valued greater than those with regard to the floating rate. It was observed that when interest

rates are below their average full term levels, the value of the floating rate debt increases with maturity. Thus, when the yield spread has an increasing trend, that is a bigger difference between the long term rate and the short term rate, firms are more likely to borrow floating rate debt

2.4.4: Sources of debt

In a market where there is no friction, firms always secure their funding for positive NPV projects as they are certain about the cash flow of the business. However, in an imperfect market, firms face cash flow volatility and information asymmetry. Thus, firms cannot be fully evaluated by outside lenders. Hence, they may be restricted in raising sufficient funds as capital to finance their projects. These frictions lead firms to differentiate between financial markets and other institutions (Diamonds 1984, 1991; Fama, 1985).

In large institutions, the financing decision is of utmost importance. As such, the source of capital is an important aspect for capital structure and debt structure. Considering debt structure (Fixed and Floating rate debt) only, firms can source their debt from banks or capital markets. The principal benefit of a bond is its re-tradability which may allow them to recover the initial lenders terms or obtain the same sum for a lower cost. However, the main drawback arises from the elevated initial cost of arranging a bond issue, and the pressure on governance exerted by the bond market.

While bonds have higher costs upon issue, they can raise capital at a lower cost than any other form of loan as they are open to a wider pool of subscribers. Issues are graded by credit-rating agencies such as Moody's, Standard and Poor's and Fitch Rating, on the basis of the likelihood of all interest being paid and the principal being returned on time. Bonds can

generally be purchased by a large firm, or any firm or investment firm, or an individual, provided that they have an appropriate investment grade assigned to them.

Loans can be raised from banks as well as syndicated across several banks, and these debts can be re-traded. However, this is generally only done if the company fails and the loan is no longer performing, at which point the bank may cut its losses by selling it at discount to a specialist distressed-debt investor. At other times, under the UK and US systems, the bank retains responsibility for the loan but does not become involved in corporate dealings on decision making.

Some characteristics of making the choice between a bank and a bond market are due to borrowing flexibility, transaction costs and asymmetric information.

2.4.4.1: Borrowing flexibility

It may not be possible to obtain certain terms from bank financing as banks are generally reluctant to lend money with long term maturities at a fixed interest rate. However, banks do lend at a floating rate debt for the short term, and even for long term maturities. If firms wish to borrow at longer term maturities, borrowing from capital markets may be more appropriate. On the other hand, it is much easier to obtain financing that is non-standard from banks because they can individually (or as a syndicate) negotiate specific terms.

2.4.4.2: Transaction costs

Transaction costs make capital market debt less attractive, especially for small amounts of capital, because the fixed costs of accessing capital markets become a larger proportion of the amount raised. Other types of costs, which can also be classified as transaction costs and may also be important, may include time taken to gain finance. It may be quicker to

obtain bank financing than to go through the process of accessing capital markets. Firms may also be required to obtain a rating when accessing capital markets. This requirement can slow the process further.

2.4.4.3: Asymmetric information

The information gap between capital markets and the firm may also impact the choice of lender. If firms have good future prospects of which the market is not aware, debt raised from capital markets may well be more expensive than it should be. It may also not be possible for the firm to convey this positive information to the capital markets, either because it is not credible or because it would affect the competitive advantage of the business. However, it may be possible to convey such positive information to a financial institution because of the one-to-one relation between the institution and the firm. This possibility has two implications. Firstly, the cost of borrowing from the bank may be lower than that from capital markets because there is less information asymmetry. Secondly, the fact that the firm has borrowed from the bank may be a positive sign to the financial markets.

2.4.4.4: Fixed and floating debt and sources of debt

Floating rate debt is normally borrowed from banks and normally has a short term debt to maturity. Floating rate debt can create liquidity risk because lenders ignore the borrower control rents and are unwilling to refinance when bad news arrives. Thus, firms may face higher liquidity risk when they choose floating rate debt over fixed rate debt. Diamond (1991) analysed debt maturity choice as a trade-off between a borrower's private information on future credit rating and liquidity risk. As lenders do not benefit from future control rents, banks tend to liquidate too often from the borrower's perspective. A firm's willingness to

select short term debt depends on the private information on its future credit ratings. When a firm expects its firm's quality to improve sufficiently, it will issue floating rate debt in terms of short term debt, and then issue fixed rate debt for long term debt after the firm has improved. Therefore, in the Diamond model, optimal maturity structure depends on the trade-off between a preference for short maturity due to expecting their credit ratings to improve, and liquidity risk. Firms with the lowest credit ratings or with no credit rating should borrow short term because they do not have any choice but to borrow short term.

In addition, credit quality plays an important role in the choice of debt (Denis and Minhov, 2003). When firms have high credit quality or an improvement in credit quality, firms are more likely to issue fixed rate debt as these firms do not need to rely on banks to source their debt. On the other hand firms having credit constraints normally have to choose between banks or financial markets. The main reason for firms to have access to capital markets is that they prefer to have long term debt which is normally at a fixed rate. However, these firms do not have the privilege of access to fixed rate debt and are restricted to financial intermediaries, a situation which leads them to borrow floating rate debt. It should be pointed out that certain firms which have access to capital markets may, however, have a preference for bank loans in the short term. Thus firms having access to capital markets or having good credit rating prefer to have fixed rate debt, while firms restricted to banks have floating rate debt.

2.4.5: Profitability and fixed and floating rate debt.

This section attempts to find the relationship between profitability (earnings) and the choice of fixed and floating rate debt. The pecking order hypothesis in Donaldson's (1961) study states that "management strongly favoured internal generation (which can be in the forms of profitability) as a source of new funds even to the exclusion of external funds except for

occasional bulges in the need for funds”. The initial conclusion of Donaldson was analysed later by Myers (1984), and Myers and Majluf (1984), who reached the following conclusion about the hierarchy of financing choices: firms will first rely on internally generated funds (that is, undistributed earnings), then they will turn to debt if additional funds are needed and, finally, they will issue equity to cover any remaining capital requirements.

There are two main rationales that have been advanced as explanations of this pattern in preferences between profitability (as internal financing) and external financing. The first rationale is the external financing transaction cost and the second is the asymmetric information theory.

According to the first rationale, transaction costs associated with obtaining new external financing play an important role in a firm’s capital decisions. Internal funds do not bear any transaction (or flotation) costs. Furthermore, the total transaction costs of new debt are typically lower than the total costs of obtaining other new external financing (Emery and Finnerty, 1997). Lee *et al.* (1996) found that flotation costs for common stock are more than twice as high as those of new debt across all levels of borrowing.

Following the asymmetric information theory, internal financing avoids the examination of suppliers of capital. If additional funds are needed, then debt is preferred, because debt issues are regarded as positive signals by investors who possess less information than managers. Thus, if debt is issued, investors will assume that management believes that the stock is undervalued. Furthermore, according to Myers (1984) under the asymmetric information theory, the pecking order pattern implies that the firm should “issue the safest possible securities whose future value changes least when the manager’s inside information is

revealed to the market”. The order is based on value volatility, the favoured source being the least volatile, thereby leaving the order of preferences (or “pecking order”) as: retained earnings, new debt and new equity.

An obvious implication of the pecking order theory is that highly profitable firms that generate high earnings are expected to use less debt capital than those that are not very profitable. Several researchers have tested the effects of profitability on firm leverage. Kester (1986) and Friend and Lang (1988) concluded that there was a significant negative relationship between profitability and debt/asset ratios. Rajan and Zingales (1995) and Wald (1999) also found a significant negative relationship between profitability and debt/asset ratios for the USA, the UK and Japan. Shyam, Sunder and Myers (1999) found support for the theory. Specifically, this inverse relationship shows support for the proposal that internal funds are preferred to debt.

Following the pecking order pattern, firms with internal sources of funds such as profitability can still sustain any changes in interest rates provided they have a low level of debt. Firms with less debt are less likely to face financial distress, and prefer profitability to finance their investments first and then debt. Firms can offset the increase in interest cost from debt, as a result of a rise in interest rates with their high earnings, and increase earnings if there is a decrease in interest rates (causing interest rate costs to decrease). Firms with high earnings act as a natural hedge to offset any increase in interest costs. Thus, these firms prefer floating rate debt. As a result, firms having more earnings are more likely to have floating rate debt. This rationale predicts a positive relationship between profitability and floating rate debt.

2.4.6: Financial distress costs and fixed and floating rate debt.

Financial distress costs can impact on the decision between the fixed and floating debt mix. This section attempts to discuss this relationship. A crucial aspect of any company's financing decision is the level of debt and the types of debt (fixed and floating) in the capital structure. An excess of financial leverage can lead to financial distress when firms are unable to pay their debt. Management should treat this situation so as to avoid the bankruptcy cost. As such, there are different techniques that the CEO and CFO need to take into consideration to mitigate the risk of financial distress. The more leverage the firm has, the higher the probability the firm will face financial distress. This can be due to fluctuations in cash flow and interest rates. Firms face financial difficulty when they fail to pay their debts and hence accrue more interest rate payments, which will add to their total debt and lead to greater distress or even bankruptcy.

One technique utilised to mitigate the fluctuation in interest rates for firms which have a high degree of financial leverage is to have fixed rate debt. As such, any adverse fluctuation in interest rates will not worsen the firm's performance. However, firms may have a policy of borrowing floating rate debt, which may be detrimental those which suffer from fluctuations in interest rates. Therefore, an increase in interest rates will negatively affect a firm's earnings as higher interest rates lead to greater interest expense, and so reduce the earnings of the firm. A drawback is that fixed rate debt is somewhat more expensive over time than floating rate debt because it shifts the risk of interest rates to the lender.

2.4.6.1: Cash flow volatility

Firms with a greater variability of cash flow are more likely to find themselves in financial distress. Cash flow volatility can arise from variability in interest rate. Thus, firms which are

aggressively financed by debt, mainly floating rate debt, are expected to experience greater difficulty in meeting interest payments and hence capital repayment. In this scenario, firms may face financial distress. When firms are in a bankruptcy situation, they are faced with aggrieved lenders and falling market share. When firms have a floating rate interest in the short term, and are facing volatility in interest rates due to the environment, a serious cash crunch may occur. This lack of cash can be a result of banks freezing or refusing overdraft facilities or when sales revenue is interest-rate sensitive. Thus firms can lock their debt at a fixed rate, which, as a result, lowers the probability of the firm encountering financial distress. Firms with stable cash flow decrease the expected cost of financial distress, thus increasing shareholders' wealth. However, when a firm does not face the experience of bankruptcy, there is a possibility that financial distress costs can still have a significant indirect cost on the firm. These costs are contracting costs with management, employees, suppliers and customers. Firms with a higher probability of financial distress are better off when they have fixed rate debt where they have better control of cash flow. Thus, a firm will not be adversely affected by a fluctuation in interest rates.

2.4.7: Firm size and fixed and floating rate debt.

The choice of fixed and floating rate debt has received much attention when considering firm size. As discussed in section 2.4.4, firms having access to the capital markets utilise fixed rate debt, and bank dependent firms have floating rate debt. To access the capital markets, firms have to build their credit score by borrowing short term debt and repay the debt successfully. Thus, firms with good repayment capacity benefit from the improvement in their credit score to obtain better credit quality. It follows that small firms with a good credit score can also access the capital markets. However, firms with high turnover or high total assets may not

have access or choose not to access the capital markets. The two possible reasons for this non accessibility issue are: firms may prefer to have access to bank debt since capital markets are costly, or it may be the preference of management. Finally, firms do not have access to capital markets since their credit ratings are too low.

Generally, firms go through the process of having short term debt, built up on their credibility by successfully repaying their short term loans. In the long run, they can gain access to capital markets to secure long term loans. Likewise, firms having high turnover or high total assets have the stable cash flow required to access the capital market. As a result, large firms are more likely to have fixed rate debt.

However, large firms may also opt for floating rate debt. This is achieved by the implementation of an appropriate risk management department in their firm to reach the threshold where the benefits of hedging outweigh the costs. Thus, firms can hedge when there are fluctuations in interest rates or when the perceived costs will increase in the near future. Hence, firms swap from floating rate to fixed rate interest on debt or vice versa. It follows that larger firms have the ability to control their debt structure by their hedging activities. Thus, large firms having derivatives are more likely to have floating rate debt.

Firms having a floating rate debt are more likely to hedge their risk whether they are large or small firms. With respect to the Froot *et al.* (1993) model, the authors predicted that firms that rely on external financing are more likely to hedge. Small firms found it costly when they relied mainly on external financing. There are in fact competing arguments for the positive or negative effects of firm size and the choice between fixed and floating rate interest on corporate debt. Therefore, the predictions based on firm size are indeterminate.

Larger firms which have access to capital markets prefer fixed rate debt, as transaction costs to capital markets are more favourable when compared to bank based debt. However, this is not the case when hedging is considered. This is due to the fact that firms can swap from fixed to floating rate debt and vice versa.

2.5: Summary of hypotheses

This chapter gives a general overview of the main determinants of the fixed and floating rate debt. In particular, it discusses the theories of capital structure. It also explains fixed and floating rate debt in conjunction with the theories of capital structure. The theoretical overview of debt structure examined in this chapter generates the following hypotheses with respect to the determinants of fixed and floating rate debt.

1. Natural Hedge

Firms should be matching the cash flow exposure from assets with the exposure of their debt liabilities to reduce exposure to interest rate risk as part of their natural hedging (risk management) strategy. This means that if they can naturally hedge their exposures through smoothing, netting, matching or other strategy, then firms are more likely to borrow at a floating rate debt.

2. Hedging benefits

Firms can alter their debt structure by using financial derivatives, such as interest rate swaps. For example, a firm that borrows at a floating rate will be likely to face exposure from the variability of interest rates, which can cause volatility in cash flows and earnings. To mitigate this risk, the firm could easily convert the floating rate debt into long term

fixed rate debt by entering into a variable-to-fixed swap contract. This strategy will not only mitigate the interest rate risk exposure and earnings volatility but also reduce the cost of capital and financial distress (Stulz, 1996; Titman, 1992). Moreover, firms can benefit from a fall in interest rates by entering a fixed to floating rate strategy. Thus firms enter a swap contract to benefit from the choice of the fixed and floating debt.

3. Market timing

The choice of fixed and floating rate debt may be driven by firms trying to time the market. Firms choose the floating rate debt when the yield curve has an increasing trend. They borrow at a floating rate debt when they think interest rates are low relative to long term debt.

4. Sources of debt

When firms are constrained to raise funds to finance their projects, floating rate debt is the more appropriate method. Such firms borrow mainly from banks and are subject to liquidity risk. However, firms having access to capital markets are more likely to have fixed rate debt (long term debt).

5. Profitability

According to Myers (1984), under the asymmetric information theory, the pecking order pattern implies that the firm should “issue the safest possible securities whose future value changes least when the manager’s inside information is revealed to the market”. The order is based on value volatility, the favoured source being the least volatile, therefore leaving the order of preferences (or “pecking order”) as: retained earnings, new debt, new equity. An obvious implication of the pecking order theory is that highly

profitable firms that generate high earnings are expected to use less debt capital than those that are not very profitable. Following the pecking order theory, firms that have more retained earnings are in a better position to face fluctuation in interest rates since they have less debt. Firms with less debt are less likely to face financial distress; hence, they prefer floating rate debt. As a result, firms having more earnings are more likely to have floating rate debt.

6. Financial distress

The arguments for financial distress with respect to the choice of fixed and floating rate debt predict that by employing a fixed rate debt, firms are more likely to have stable cash flows. It follows that firms which borrow floating rate debt may face financial distress due to fluctuations in both interest rates and cash flows. As such, firms which are aggressively financed by debt prefer to avoid floating rate debt

7. Firm Size

Firms having access to capital markets are most likely to be large firms and prefer fixed rate debt. Large mainly non-financial firms prefer to be more stable to avoid any fluctuation in both interest rates and cash flow. This fixed rate debt is more appropriate even with the associated high transaction costs.

The next chapter takes into consideration the arguments for the choice between fixed and floating rate debt by reviewing the literature. It also provides the variables and proxies that will help the researcher to analyse the determinants of fixed and floating rate debt.

Chapter 3: Empirical Literature Review

3.1: Introduction

Early capital structure literature has stated that corporate financing policy and choice of liability structure is irrelevant in the absence of contracting costs and taxes (for example, in a perfect capital market); this is the fundamental assumption drawn from the Modigliani-Miller theorem (Miller and Modigliani, 1958). Relaxing this assumption provides potential justification for a capital structure choice based on the trade-off between the tax benefits of debt and the bankruptcy costs of debt. Other possible justifications for the relevance of the capital structure decision include: the costs of asymmetric information as suggested by Myers' pecking order theory (1984), agency costs such as those related to the asset substitution effect (Jensen and Meckling, 1976), the underinvestment problem (Myers, 1977) and the free cash flow situation (Jensen, 1986). Another interpretation of the relevance of capital structure is the market timing hypothesis (Baker and Wurgler, 2004) stating that the first order determinant of a corporation capital structure is relative to the mispricing of these instruments at the time the firm needs to finance investment.

An analysis of the trade-off theory of capital structure was provided by Leland (1994) in the case where a single class of debt (fixed debt) was considered.⁶ In an attempt to account for more realistic debt characteristics, Leland and Toft (1996) developed Leland's (1994) original ideas to allow the examination of other classes of debt such as finite debt maturity on bond prices, credit spreads, and optimal leverage. In these papers (Leland, 1994; Leland and Toft, 1996) and related papers (Mello and Parsons, 1992; Leland, 1998; Fan and Sundaresan,

⁶ See also Brennan and Schwartz (1978), who were the first to use the contingent-claims analysis approach of Black and Scholes (1973), Merton (1974), and Black and Cox (1976) in the analysis of capital structure decisions.

2000; Goldstein *et al.*, 2001; Miao, 2002; Morellec, 2004), corporate debt is exclusively represented by a fixed-coupon bond. In other words, these papers focus on the equity versus debt decision, but remain silent with respect to the optimal allocation to various types of debt instruments for example fixed or floating rate debt. Therefore, it is clear that the assumption of a single class of fixed rate market debt does not give a complete picture within corporate practice, where various classes of debt instruments are issued, such as floating rate bonds. Martellini and Milhau (2009), focussing only on floating rate debt, find that 42% of the firms in the Compustat database issue this class of debt. The FRS 13 since 1999 has led to the disclosure of the variety of debt structure utilised, which includes fixed and floating debt. This indicates that there is a trend in the behaviour of firms towards the use of a mix of fixed and floating rate debt. Thus, prior to 1999, the question of the choice of fixed and floating rate debt mix has been ignored by the capital structure discussion due to lack of disclosure.

Chapter 2 (section 2.4, *p.25*) provided a review of the factors of corporate finance theory which might be important in determining a firm's fixed and floating debt mix. Choosing a particular type of debt may engender certain types of inherent risk. Depending on the amount of debt as well as the level of risk, firms have to either naturally hedge their exposure or use derivatives. Firms may also consider using market timing in place of or in addition to risk management in choosing the floating rate debt. Thus, firms acquire floating rate debt when the perceived cost of floating rate debt is lower than the fixed rate debt and vice versa (Rokkanen, 2007). Information asymmetry can also be an important factor when choosing floating rate debt. Firms may be able to finance their investment depending on the quality of their access to the capital markets, and those with access will choose to have less floating rate debt, whereas firms dependent on banks are restricted to floating rate debt only. This assumption is supported by Faulkender (2005) who provides evidence that larger and more

profitable firms are more likely to issue fixed rate debt, whereas smaller and less profitable firms issue floating rate debt. Faulkender (2005) argues that this is partly dependent on market segmentation, where only larger firms are able to access public markets to issue fixed rate debt, while smaller firms are restricted to floating rate bank debt.

This chapter critically evaluates the extent of the empirical literature on the determinants of the fixed and floating debt mix. It shows how this literature has been explored and has grown over the last few years. From the literature reviewed by this research and to the best of the writer's knowledge, this current research is the only study of its kind to employ UK data on the determinant of fixed and floating rate debt. This study has been achieved largely as a result of the importance of the different types of debt for example the fixed and floating rate debt from improved financial reporting disclosures, particularly regarding the financial risk profile the financial assets and liabilities of firms. The study of fixed and floating debt is related to the theories of capital structure. There are only a few studies focussing on the fixed and floating rate debt mix which is part of the capital structure.

The chapter first discusses the determinants of the capital structure and its types of debt involved. The literature follows by the definition and the measures of fixed and floating rate debt. Some studies measure floating rate debt as a ratio of floating rate debt to total debt (Chava and Purnanandam, 2007; Chernenko and Faulkender, 2007), whereas others use the dummy variable to explain the floating rate debt (Faulkender, 2005; Antoniou *et al.*, 2009; Vickery, 2008). This is followed by an examination of the determinants of floating rate debt in how each determinant relates to the capital structure theories and how each affects the fixed and floating rate debt. It also explains the different proxies related to each determinant. The key determinants discussed in this chapter are the natural hedge, hedging and market

timing. This is followed by the sources of debt, financial distress, growth opportunity and firm size.

3.2: Capital structure and fixed and floating debt.

A firm's capital structure can be broadly classified into debt and equity. Interest payments on debt are tax deductible, while dividends, a distribution to shareholders, are not tax deductible. The existence of such a tax shelter for interest may lead firms to use the maximum amount of debt. Since the seminal Modigliani and Miller (1958) paper showing that, subject to some conditions, the impact of financing on the value of a firm is irrelevant, the literature on capital structure has been expanded by many theoretical and empirical contributions. Much emphasis has been placed on relaxing the assumptions made by MM, in particular by taking into account corporate taxes (Modigliani and Miller, 1963), personal taxes (Miller, 1977), bankruptcy costs (Stiglitz, 1972; Titman, 1984), agency costs (Jensen and Meckling, 1976; Myers, 1977), and informational asymmetries (Myers, 1984).

The identification of factors affecting a firm's choice of capital structure has long been a subject of debate. Myers (1977) commented on the problem by noting the existence of an important gap in financial theory regarding the issue of corporate debt policy. He further implied that the theory does not explain why tax savings generated by debt do not lead firms to borrow to the maximum possible limit, or why firms finance with instruments of widely different maturity. However, Prasad, Green and Murinde (2001) pointed out that very little is known about company financing decisions in developing countries. According to Rajan and Zingales (1995), the more a company depends on external finance, in the initial phase of development the company tends to be in relatively higher need of external finance.

Brigham and Ehrhardt (2001) revealed that wide variations in capital structure exist among industries and among individual firms within those industries. Capital structure variations also occur within a given firm over time. The percentage of debt in a firm's capital structure also varies widely across apparently similar firms. The development of capital markets also influences capital structure (Booth *et al.*, 2001). The economic development of the country influences capital structure decisions (Rajan and Zingales 1995; Booth *et al.*, 2001; Yong *et al.*, 2008). Therefore, from the macroeconomic perspective, the debt ratio of the firm is the function of economic growth rate, capital market development, liquidity and Miller's tax advantage (Booth *et al.*, 2001; Karajeczyk and Levy 2003; Pfaffermayr, Stock and Winner 2008).

The cross section analysis by Rajan and Zingales (1995) is one of the first attempts to test for the G7 countries regarding the theoretical and empirical lessons learnt from the US studies. These authors find similar levels of leverage across countries; thus refuting the idea that firms in bank-oriented countries are more leveraged than those in market-oriented countries. However, they recognize that this distinction is useful in analyzing the various sources of financing. Rajan and Zingales (1995) find that the determinants of capital structure that have been reported for the USA (size, growth, profitability, and importance of tangible assets) are important in other countries as well. They show that a good understanding of the relevant institutional context (bankruptcy law, fiscal treatment, ownership concentration, and accounting standards) is required when identifying the fundamental determinants of capital structure. The analysis by Booth *et al.* (2001) suggests that the same determinants of capital structure prevail in ten developing countries. These studies, however, do not shed any light on the adjustment process of the capital structure.

Other studies, which have addressed the dynamic nature of capital structure decisions, also suffer from some limitations. For example, the results of Taggart (1977), Marsh (1982), and Jalilvand and Harris (1984) may be biased as they use future information about leverage as a proxy of the optimal debt ratio. Moreover, the tests of the target adjustment model lack power as they are unable to reject the target adjustment hypothesis even when financing is generated according to POT only (Shyam-Sunders and Myers, 1999). With respect to the empirical validation of pecking order theory, Chirinko and Singha (2000) show that the tests by Shyam, Sunders and Myers (1999) may be misleading. In addition, Frank and Goyal (2006) reject the fact that the debt level is determined fundamentally by the financing deficit, and find evidence of mean reversion of leverage, the adjustment process being influenced by the variables used by Rajan and Zingales (1995).

Other studies focused on capital structure and its effect to stock price. The literature are quite mixed between capital structure and stock returns. Bhandari (1988) and Sivaprasad and Muradoglu (2007) find that returns increase in leverage, while Korteweg (2004), Penman, Richardson, and Tuna (2007), and George and Hwang (2007) find that returns decrease in leverage. Cai and Zang (2009) suggest that the effect of the leverage level (if any) is subsumed by the effect of change in leverage ratio. Other studies focus on different aspects of capital structure in the UK (Ozkan, 2001; Lasfer, 1995; Antoniou et al., 2008; Ang 1991; Muradoglu et al., 2009) but did not take into account the fixed and floating rate debt

Debt is one of the most common sources of external funds. It can be classified in terms of short term versus long term debt, secured versus unsecured, publicly traded versus privately traded, or bank debt and non bank debt. The research in corporate finance argues that corporate capital structure should include the different types of debt (Diamond, 1993; Park,

2000; Bolton and Freixas, 2000; DeMarzo and Fishman, 2007). The remaining studies in capital structure (Titman and Wessels, 1988; Barclay and Smith, 1995; Rajan and Zingales, 1995; Stohn and Mauer, 1996; Shyam, Sunders and Myers, 1999; Chirinko and Singha, 2000; Frank and Goyal, 2006; Booth *et al.*, 2001; Yong *et al.*, 2008) treat debt as homogeneous. Although in the literature the analysis is based on the use of different types of debt such as bank and non bank debt, short term and long term, one aspect of debt that has received limited attention is the amount of debt with fixed and floating debt in the capital structure. This research attempts to find the effect of capital structure by using fixed and floating debt.

3.3: How fixed and floating rate debt is defined and measured

The ability to identify which firms use fixed or floating rate debt or a mixture of both is vital if reliable empirical tests are to be undertaken. This identification is not straightforward; to capture the information in the past was practically impossible but now the introduction of FRS 13 disclosure has led to greater detail of the forms and class of debt firms have. A firm's debt can be in the form of fixed rate, floating rate or a mixture of both. A fixed rate contract locks the periodical coupon payments of the contract until maturity, whereas floating rate debt represents essentially a security consisting of consecutive short term contracts priced with the same credit-risk premium over the life span of the agreement, but adjusted periodically for the underlying interest rate movements (Rokkanen, 2007).

How fixed and floating rate debt structure is defined and measured is critical to the empirical examination of the determinants of the choice between fixed and floating debt. The empirical literature has approached this issue in several ways depending on the objectives of each study. Faulkender (2005) examined whether firms are hedging or timing the market when choosing the interest rate exposure of their debts. He combined the initial exposure of newly issued

debt securities with their use of interest rate swaps in his study. Antoniou *et al.* (2009) examined the fixed and floating rate debt both before and after new debt issues and whether they affect a firm's interest rate exposure. Chava and Purnanandam (2007) looked at what motivates firms to choose between fixed and floating debt. They analysed the effect of managerial incentives, firm characteristics and market timing on the fixed and floating debt structure. Chava and Purnanandam (2007) used levels of outstanding debt to determine the choice between fixed and floating rate debt. Rokkanen (2007) considered incremental debts, as well as original issues, to analyse the floating –to –fixed rate debt structure of firms.

Scholars have investigated the choice of fixed and floating rate debt mix by using different information and from different perspectives. Some studies examine new debt issues (Faulkender, 2005), and outstanding debt (Faulkender and Chernenko, 2007; Chava and Purnanandan, 2007), while others analyse the incremental debts (Antoniou *et al.*, 2009; Rokkanen, 2007) to determine the structure of corporate debt. The measurement of the fixed and floating variable is described in Table 1.

Table 1 Definition and measurement of fixed and floating rate debt mix

Author(s) of Study	Year	Dependent Variable	Types of Data used	Country	Sample period	Sample Size	Derivatives Control	Hand collected and adjusted for derivatives
Faulkender	2005	Final Interest rate exposure of newly issued debt	New issued debts	US	1994-1999	133	No mention	No
Antoniou <i>et al.</i>	2009	Binary floating rate debt (Deal types) (1) otherwise (0)	Incremental debt issues	UK	1986-2004	742 /217 firms	No mention	No
Vickery	2008	Fixed rate (0) and floating rate (1)	Most recent loans (fewer than 500 employees)	US	1987, 1993,1998	3248 Loans	No mention	No
Faulkender and Chernenko	2007	Floating debt percentage plus interest rate swap usage	Outstanding debt	US	1993-2003	1854 firms	Yes	Hand collected and adjusted for derivatives
Chava and Purnanandam	2007	Floating debt /total debt	Outstanding debt	US	1997 and 2000	2051	Yes	Hand collected and adjusted for derivatives
Rokkanen	2007	Binary (floating rate (1) otherwise (0)	Incremental Corporate Debt Issues	Sweden	1999-2006	1327	Yes	No

Source: Author

Table 1 summarizes how the empirical studies define and measure the fixed and floating debt mix. The size of the sample, the period of each study, and data that is adjusted for the use of derivatives.

Table 1 shows how each research study defines its fixed and floating debt mix. It indicates clearly the period when data was collected, the sample size, the control for derivatives and how the data was collected.

Chava and Purnanandam (2007) measure their dependent variable as the outstanding floating debt to total debt of each firm for the periods 1996/1997 and 1999/2000. The outstanding debt is collected before derivatives and is manually adjusted to obtain outstanding debt after derivatives. Hence, they measure floating rate debt as the sum of short term debt and long term debt, both of which are tied to the prime lending rate prior to derivatives, available from Compustat. Then they account for the net effect of swaps to achieve the net floating rate debt and scale it over the total debt.

Similarly, Faulkender and Chernenko (2007) employed the net floating rate after swap for a period of 10 years from 1993-2003. They define the net floating rate swap as pay floating received fixed notional amount minus pay fixed received floating notional amount. In addition, they combine the floating rate debt with the swap usage to estimate the amount of a firm's debt that is floating after accounting for the effects of interest rate swaps. The net floating rate swap amount is the floating rate debt divided by the outstanding debt at the end of the fiscal year.

However, Faulkender (2005) measures the fixed and floating rate variable, for a period of five years from 1994-1999, by employing two different methods. Firstly, he uses the final exposure of new debt issues that is floating debt as the value one (1) and zero otherwise. The final exposure is defined as the exposure of the debt instrument obtained by combining the initial exposure with any interest rate swaps used to modify that exposure. The second

method of dependent variable measurement is the percentage of the long term debt, which has a floating interest rate exposure after accounting for any swaps the firm had entered. He, therefore, uses the existing exposure of debt.

Antoniou *et al.* (2009) collected new debt issues over a time series of 18 years (for the period of 1986- 2004), in which they aggregated the number of deals with respect to debt issues with different yield types and maturities to find out whether there are any changes in the exposure in an event study.. Moreover, they defined their dependent variable as “1” if the final yield type of the debt funds was floating and zero otherwise. The debt maturity was also tested as the dependent variable in Antoniou *et al.* (2009) and used the short term variables denoted by number “1”, long term maturity as negative one “-1” and zero otherwise. Similarly, Rokkanen (2007) employed a Swedish dataset for the period 1999-2006. He examined the original interest rate exposure of debt for incremental corporate debt issues in the absence of derivatives, employing the same dummy variable “1” if a firm’s incremental debt issue is floating rate debt and “0” otherwise.

Table 1 also shows that some studies measure the fixed and floating mix as a dummy variable, while others as a ratio of floating rate debt to total debt. The dummy variable groups data either as a zero for fixed or “1” as floating vice versa. This means that it quantifies a model only at these two extremes. Hence, the dummy variable ignores information that is between the two groups. Dummy variables work if all the debt is either in fixed or floating. A better measure of the fixed or floating is to apply the ratio of floating debt ratio conducted by Chava and Purnanandam (2007) and Faulkender and Chernenko (2007), which gives a continuous percentage of the floating rate debt ratio as compared to dummy variable.

Most studies in Table 1 utilise different types of data from different sources as they are uncovered in different countries. Moreover, each study in Table 1 has different time periods and also shows that the study of fixed and floating debt mix is more common in the USA with four studies, and one in the UK and Sweden respectively. However, the research by Antoniou *et al.* (2009) is the only study in the UK to concentrate on incremental debt. In addition, this study investigates only the number of deals (debts) which are either fixed or floating rather than the amount of debt.

In the UK, the examination of fixed and floating interest rate of corporate debt was not possible till the introduction of the FRS13. Thus, research on fixed and floating rate debt was slowed down by the general unavailability of data on the interest rate mix of a firm's debt. It is only post FRS13 that firms are required to disclose the details of their financial instruments. Thus, firms disclose not only their total debts, but also distinguish them between total floating debt and total fixed debt after derivatives. As a result, a firm's total floating rate debt ratio is calculated for each firm and for each year by taking floating rate debt scaled to total debt. This research study follows the same methods of calculating the floating rate debt ratio as Chava and Purnanandam (2007) and is the first study of its kind, according to the writer's knowledge, in the UK environment. Another important issue where studies in Table 1 have been non-existent is the currency denomination of debt and floating rate debt.

Faulkender (2005), Antoniou *et al.* (2009), Faulkender and Chernenko (2007) and Rokkanen (2007) use data sources over several consecutive years. However, Chava and Purnanandam (2007) collect data at two different points in time (1997 and 2000) for US firms. Vickery (2008) uses data for the years 1987, 1993 and 1998 collected from the small business finance (SBF) database. Data is kept at regular intervals of 5 years in this specific database. One

advantage of having data over several years is that it facilitates the examination of the determinants of the fixed and floating mix as well as the determinants at a given point in time. This research is the first of its kind to employ outstanding debt for non-financial firms in the UK context and attempts to solve this problem by a rigorous collection of information from 1999-2004. It is a combination similar to that of Chava and Purnanandam (2007) where only outstanding debt is taken into account within a continuous time frame and collected after the use of derivatives.

3.4: Determinants of fixed and floating rate debt mix

This section critically evaluates the current literature on the determinants of fixed and floating rate debt, and the variables and methods used in the studies are reviewed here. The determinants of the fixed and floating rate debt mix are as follows: natural hedging (interest rate sensitivity and cash flow beta), hedging, market timing, sources of debt, financial distress, underinvestment cost and firm size.

It is important to recognise that there are inherent risks in both fixed rate and floating rate exposures. A firm's choice between fixed and floating rate debt is dependent on the structure of its risk management strategies. As such firms can use risk management techniques to manage their cash flow by either internal methods (natural hedging) or by using derivative techniques. An adequate mix of fixed and floating rate instruments ensures diversification of interest rate exposure. Although a number of financial products are available for managing the interest rate risk of financial assets and financial liabilities, a company may not always hedge its exposure or, in certain cases, may use various operating (internal) strategies to reduce exposure to interest rates.

3.4.1: Natural hedge

This section deals with the internal hedging strategies that firms adopt. Operating or internal hedging strategies for managing interest rate risk involve restructuring the company's assets and liabilities in such a way that interest rate exposure can be minimised. Firms may adopt a smoothing strategy and therefore attempt to maintain a certain balance between fixed and floating rate borrowing. The portfolio of fixed and floating rate debts thus provides a natural hedge against changes in interest rates. Moreover, firms can match their assets and liabilities to have a common interest rate. If a company borrows funds at a floating rate debt to finance an investment, it can be at risk when there is fluctuation in interest rates. To counteract this problem, it can also apply the netting strategy to mitigate the interest rate risk. In netting, the company aggregates all positions, both assets and liabilities, to determine the net exposure. If a company has interest bearing investments of, say, £100 million and a loan of, say, £150 million, then the company would only hedge the net exposure of £50 million as the interest rate risk on the investment would offset the risk on the loan. The literature attempts to convey which methods are the most appropriate as a determinant of the floating rate debt. Table 2 gives an insight into the different measures of natural hedging.

Table 2: Empirical evidence on natural hedging

Author(s) of Study	Year	Natural Hedging	Expected Sign	Estimated Sign	Significance
Faulkender	2005	Interest rate sensitivity	Positive	Negative	Insignificant
Covitz and Sharpe	2006	Interest rate sensitivity	Positive	Positive	Insignificant
Vickery	2008	Industry interest rate sensitivity	Negative	Negative	Significant
Antoniou <i>et al.</i>	2009	Interest rate sensitivity	Positive	Negative	Insignificant
Chava and Purnanandam	2007	Cash flow beta	Positive	Negative	Insignificant

Source: Author

Table 2 shows the different methods utilised by different authors as a proxy for natural hedging. The main methods used are: industry interest rate beta, interest rate sensitivity and cash flow beta. Table 2 also shows the expected direction of the sign as well as the estimated direction of the sign of the proxies employed for each study, all of which are discussed in the following sub-sections of this chapter.

3.4.1.1: Industry interest rate beta

Fluctuations in interest rates affect the volatility of cash flows by reducing retained earnings. As such the exposure on interest rate risk varies from firm to firm. Moreover, interest rate risk can vary from industry to industry. One way to measure natural hedging is via industry interest rate sensitivity (Industry Interest Rate Beta).

Vickery (2008) attempts to determine whether higher internal cash flows will at least partially offset the effects of interest rates on the supply of credit when cash flows co-vary positively with interest rates. Thus, firms have a ‘natural hedge’ against rising interest rates, and fixed rate debt is less likely to be the optimal choice.

Vickery’s (2008) research utilises two steps in the analysis of the determinants of fixed rate debt. The first involves the estimation of the correlation between industry output and interest rates for the period 1960-2000. For each industry, the logarithm of industry output is regressed on the 12-month nominal riskless rate of interest with the incorporation of time trend. The second involves the running of another regression with the ‘fixed-versus-adjustable’ as a dependent variable which incorporates the correlation of the first step. Vickery (2008) found that there was no evidence to support the choice of fixed and adjustable debt when using industry interest rate beta. It can, therefore, be assumed that small firms are less likely to match with a fixed rate loan.

3.4.1.2: Interest rate sensitivity

Firms face interest rate risk if the variability of interest rates leads to volatility in cash flow or firm value. The interest rate risk is derived from two sources: the asset interest rate sensitivity and the debt interest rate sensitivity (Faulkender, 2005). Variability in interest rates will impact on the volatility of cash flow regarding both assets and debt. In this situation, firms are likely to utilise the natural hedging strategy to smooth the cash flow. With a sample of 275 debt issuances from 133 firms over the period 1994-1999, Faulkender (2005) utilised quarterly observations for each firm, five years prior to the issue of the debt, to determine the sensitivity of each firm's changes in the London Inter Bank Offer Rate (LIBOR). It is relevant when determining the hedging benefits that cash flow moves in the same direction as the LIBOR. Contrary to this, Faulkender (2005) finds that the coefficient of interest rate sensitivity is negative. Thus, interest rate sensitivity of a firm's cash flow in this study may not be an important factor in determining the choice of the final fixed or floating exposure on its debt security.

One of the problems with Faulkender (2005) is that he employs only 20 continuous quarterly cash flows covering a time period of 5 fiscal years prior to debt issues to measure company interest rate exposure. Twenty observations are not sufficient to accurately measure company interest rate exposure according to Antoniou *et al.* (2009). Kaplin and Levy (2001) state that the use of cash flows may also be problematic for two reasons. Firstly, firms usually decorate their financial statements to smooth out their cash flows and, secondly, due to the discontinuous nature of reporting cash flow (cash flows are usually reported annually or semi-annually), it is not appropriate to measure interest rate sensitivity as it does not take into account the changes in interest rates between the reporting periods. Therefore it is inaccurate to measure a firm's interest rate sensitivity by using cash flow.

In similar research, Antoniou *et al.* (2009) measure company interest rate exposure before debt issue. They then examine the incremental interest rate exposure resulting from the newly issued debts. A direct comparison between interest rate exposure before and after debt issue is to determine whether or not those firms are adopting hedging strategies to manage their interest rate exposure. Antoniou *et al.* (2009) use stock price as method for estimating a firm's interest rate sensitivity (Antoniou *et al.*, 2009) as opposed to cash flow (Faulkender, 2005). Antoniou *et al.* (2009) use an event window to measure the effects of debt issue on a firm's initial interest rate exposure. Antoniou *et al.* (2009) observed a negative coefficient, which therefore indicates that interest rate sensitivity may not be an appropriate determinant of the choice of fixed and floating rate debt when firms issue debts.

Covitz and Sharpe (2006) conducted their study on interest rate derivative usage and made use of the interest rate sensitivity of the assets. They measure interest rate sensitivity by regressing operating earnings scaled by book value assets to market interest rates. When the annual data for the interest rate sensitivity is not available, they pool all firms in a given industry into a single regression. They do not find any evidence that non-financial firms hedge interest rate exposures from their operating assets, consistent with Faulkender (2005).

3.4.1.3: Cash flow beta

Another method to measure natural hedging is the cash flow beta, as measured by a positive correlation between a firm's before-interest operating cash flow and interest rates (Chava and Purnanandam, 2007). The positive correlation between operating cash flow and interest rate lends firms to have more floating rate debt and thus to a volatility decreasing effect. Such firms have a natural hedge against interest rate risk. Chava and Purnanandam (2007) used

cash flow beta and found that less than 10% of their sample of firms can use cash flow beta as a measure of natural hedging. Thus the majority of firms using floating rate debt cannot measure natural hedging and so are more open to interest rate risk.

Chava and Purnanandam (2007) looked at the interaction of CFO incentives with a firm's cash flow beta to determine whether higher CFO Vega⁷ (delta⁸) was associated with variance increasing (decreasing) debt strategy. They found that the effects of CFO incentives are present only for firms that cannot naturally hedge with respect to interest rate fluctuations. Overall, these results show that firms adopt a volatility increasing debt structure when CFOs have incentives to increase interest rate risk, and a volatility decreasing structure when they have incentives to decrease interest rate risk.

Similar to Faulkender (2005), Chava and Purnanandam (2007) measure the cash flow beta by using quarterly cash flows. Quarterly cash flows over a 10-year period can prove a better measure to that of Faulkender (2005) as there are more observations. However, quarterly cash flows may appear inappropriate since firms frequently manipulate their financial statements to achieve their expected targets.

Firms attempt to naturally hedge their interest rates by employing different measures when choosing the type of debt. As shown in Table 2, firms employ cash flow beta (Chava and Purnanandam, 2007), interest rate sensitivity (Faulkender, 2005; Faulkender and Chernenko, 2006; Covitz and Sharp, 2006; Antoniou *et al.*, 2009) and industry interest rate sensitivity (Vickery, 2008). The results displayed in Table 2 show that, with the exception of Vickery (2008), there is no evidence of natural hedging to minimise their interest rate risk when choosing between the fixed and floating rate debt. Although different types of measure are

⁷ Vega measures the change in the manager's wealth for a 1% change in stock return volatility.

⁸ Delta measures the change in the manager's wealth for a 1% change in stock price.

employed, the literature does not determine what the appropriate measures for natural hedging are. From the author's review, it appears that the literature fails to consider the percentage of the ratio of financial assets to financial liabilities, which might be a measure of natural hedge. Therefore, this study focuses on UK non-financial firms in an attempt to explore natural hedging as measured by the ratio of assets to debts. When firms have short term investments in the form of short term deposits and certificates and at the same time have financial liabilities, the short term financial assets which generate inflows can be matched with the outflows of the financial liabilities.

3.4.2: Hedging and fixed and floating rate debt

A number of empirical studies (Fenn, Post and Sharpe, 1996; Covitz and Sharpe, 2005) have also investigated the relationship between interest rate derivatives and choice of debt structure. The findings of these studies, although broadly consistent with the theoretical arguments for hedging, have also produced some mixed results. Fenn, Post, and Sharpe (1996) find evidence that firms use swaps to hedge interest rate risk arising from their short term floating rate debt obligations but find no evidence that they hedge interest rate exposure arising from operating income (assets). Visvanathan (1998) concludes that it is the debt maturity structure and financial distress costs and not the interest rate sensitivity of operating cash flows that induce large firms to use swaps to alter their interest payments from fixed to floating rate debt. In a more recent study, Covitz and Sharpe (2005) analyze the debt structure and interest rate swap positions of non-financial firms in years 2000 and 2002. They find that smaller and lower-rated (debt ratings) firms face higher interest exposure from their liabilities than larger firms, and they, consequently, are more likely to use swaps to offset this exposure. On the other hand, larger firms mitigate their interest exposure through long term debt financing rather than through the use of derivatives.

Wall (1989) argues that management have incentives to increase the risk of the firm at the expense of bondholders. Issuing more fixed rate debt (long term debt) not only increases the risk of financial distress and potential bankruptcy, but also leads to underinvestment. Bond holders recognize this incentive and will demand a higher premium on long term debt and impose debt covenants to protect their interests so as to avoid a wealth transfer to shareholders. In contrast, the premium paid by highly rated firms is lower because these firms have established a good credit reputation. To avoid this agency cost, lower rated firms will, therefore, issue short term debt and swap into synthetic fixed-rate debt. Wall (1989) argues that synthetic fixed rate debt will lower debt-financing costs by discouraging management from engaging in opportunistic or risky behaviour. Hence, interest rate swaps can reduce agency costs by reducing interest rate exposure prevalent with long term debt.

The literature reviewed in this part of this chapter suggests that interest rate swaps are one of the main determinants of fixed and floating rate debt. Hence, interest rate swaps facilitate firms in determining their debt mix. However, the lack of literature in the UK on debt mix and hedging is limited or non-existent. This study attempts to investigate interest rate swaps as a measure of hedging and natural hedging as determinant of debt mix. Moreover, firms can also hedge their foreign exchange exposure. Berrospide *et al.* (2008) consider the effect of hedging with foreign currency derivatives on Brazilian firms by focussing on foreign and domestic debt. However, an important aspect that the literature has failed to explore is the percentage of debt that has a floating rate debt exposure and the domestic floating rate debt exposure. Thus this research attempts to fill this gap.

3.4.3: Market conditions

Market timing theory (or windows of opportunity) states that firms prefer external equity when the cost of equity is low, and prefer debt otherwise. According to market timing theory, corporate executives sometimes perceive their risky securities as mis-valued by the market. This refers to the strategy of making a buy or sale decision on the basis of beliefs about future share price movements.

Recently, documented evidence by Graham and Harvey (2001) suggests that financial managers also try to time debt markets by switching between short and long term debts, which are conditional on market interest rates. Graham and Harvey (2001) surveyed 392 CFOs and found results that suggested that company managers attempt to time debt market interest rates by switching between short term and long term debt. They borrow short term (floating rate debt) when they think that interest rates are low relative to long term rates (fixed rate) or vice versa. Barclay and Smith (1995) and Guedes and Opler (1996) found that debt maturity is negatively related to term spread.

Baker and Wurgler (2002) show that market timing has a very large and persistent effect on the capital structure of US firms. They propose market timing theory as an explanation of capital structure choice. They show that market timing has a long lasting effect on capital structure and that managers who care about ongoing shareholders have the incentive to time the market to gain most benefit for these ongoing shareholders. In support of Baker and Wurgler (2002), Welch (2004) found that stock returns or equity price shocks have a long run impact on capital structure. He concluded that stock return is the fundamental determinant of capital structure. The literature on market timing and capital structure choice is expanding but little research has been conducted taking into account the fixed and floating rate debt

perspective. When issuing debt, firms might consider hedging interest rate exposure or market timing (Faulkender, 2005). Recent studies reveal that the majority of firms do not systematically hedge their risk exposure. The extent to which they hedge depends on their market views of expected volatility (Boder *et al.*, 1998). Most firms adopt “profit-oriented” and “forecast-based” hedging strategies (Glaum, 2002). In other words, they are timing the market. They attempt to hedge risks with a view that they can correctly predict future market movements. If this is indeed the case, it implies that firms believe they are capable of timing the market and thereby reduce their costs of capital. Thus, debt issues would mainly be driven by debt market conditions.

According to the general market timing view, when the yield spread (the difference between the long term and short term interest rate) increases, firms are more likely to borrow floating rate debt. Research on the term structure of interest rates is vast and rich, and based on many models and empirical studies explaining the relationship between yield curve movements and economic conditions (Estrella and Hardouvelis, 1991; Campbell, 1995; Estrella, 2005). Building on the empirical work of these theories, Faulkender (2005) shows the interest rate exposure of a firm’s new debt fluctuates over time in response to changes in debt market conditions similar to the level of interest rates and the shape of the yield curve. Using several measures of yield spread, such as the difference in the thirty-year treasuries relative to one-year, the five-year treasuries relative to one-year, and the ten-year treasuries relative to two-year, Faulkender (2005) finds that chemical firms are more likely to borrow at a floating rate debt when the yield curve is steep. In all three cases, the yield spread has the same strong statistical positive sign and economic significance. Similarly, Baker, Greenwood and Wurgler (2003) find that firms are more likely to borrow short term when the yield curve is steep. In

most cases, short term debt is more likely to be tied up with floating rate as firms are more likely to borrow from banks for this particular type of debt.

Faulkender and Chernenko (2007) use the term ‘spread of interest rate’ as a proxy for market timing to explain the effects on the floating debt. They found that changes in the term structure affect the percentage of floating rate debt. Their results show that the greater the increase in the slope of the term structure, the higher the portion of debt with floating rate exposure. One of the variables unique to Faulkender and Chernenko (2007) is that they utilise an economy-wide percentage of floating rate debt, meant to capture changes in lending sources over time, which may impact on a firm’s initial interest rate exposure. They also extend their market timing hypothesis by showing that derivative usage and choice of interest rate exposure is primarily driven by a desire of managers to meet consensus earning forecasts and to raise managerial pay.

In a similar area of research to Faulkender (2005), Vickery (2008) examined small firms to test whether market timing affects the share of fixed rate loans. Vickery’s study employs three measures of market timing: yield spread (10-1 year), quarterly inflation and real interest rate. Vickery’s (2008) results indicate that firms are more likely to borrow at an adjustable interest rate when the yield curve is steep or the real federal fund rate is high. A one percentage point increase in the real interest rate is estimated to reduce the fixed rate share by 4.8 percentage points, while a one percentage point increase in the 10 year - 1 year interest rate spread reduces the fixed rate share by 7.4 percentage points. Both estimates are significant to 1 per cent level. The inflation rate coefficient is close to zero and not statistically significant. Vickery (2008) obtained similar results to those of Faulkender (2005) discussed previously, although this sample was restricted to small firms.

Rokkanen (2007) uses the yield curve as measured by the difference between 10-year and three-month Euri-bond, and the 3-month Euri-bond, to investigate the fixed and floating rate debt mix. However, Rokkanen's (2007) results are contrary to the market timing hypothesis. The coefficients of the market timing variable are negative and significant. Rokkanen (2007) provides two potential reasons for this. Firstly, the negative results were reached at two different points in time: a historical low-point for European interest rates combined with the very steep in-sample yield curve (Rokkanen, 2007). In addition to that, while the short term interest rates fell in 2003, the yield curve kept on rising, but with historically low interest rates, fixed rate issuance being still the preferred choice in the market. However, as the yield curve steepness reached its peak, issuers turned to floating rate debt and favoured adjustable rate debt in 2004. These events produced the negative relationship in the sub-sample, reflected also in the full-sample regressions.

Chava and Purnanandam (2007) also investigated the market timing as part of the fixed and floating rate debt mix. To assess the impact of the yield curve prevailing at the time of past debt issues, Chava and Purnanandam (2007) computed the average level of term-spread (the difference between ten- and one-year treasuries) at the time these debts were issued for each firm. They denote the measure of market timing as the mean term-spread. If firms are market-timing their floating- fixed rate debt decision, Chava and Purnanandam (2007) predict a positive relationship between the ratio of floating rate debt and the mean term-spread. They consider all term-loan facilities from Dealscan and public debt issues in the past ten years to compute the average term-spread prevailing in the months of borrowing for each sample of firm. If they do not find any debt or term-loan issuance for a sample in the databases (for example, a firm that borrows exclusively through lines of credit), they set mean term-spread to zero. This implicitly assumes that the current debt structure is unaffected by any yield

curve related considerations for such firms. The results illustrate that Chava and Purnanandam (2007) failed to find any evidence in support of the market timing hypothesis.

Debt market timing patterns are held not only for large firms but also for small firms. Baker *et al.* (2003) find that debt market timing patterns are most pronounced amongst the largest and most mature firms. The fact that these patterns extend to small firms sheds some light on the underlying economic explanations for ‘market timing’ patterns. In a recent paper, Chernenko, Faulkender and Milbourn (2006) argue that Faulkender’s (2005) result affects a firm’s use of adjustable rate debt. When the yield curve is steep, firms attempt to meet consensus earning forecasts. This is determined by the compensation structure of the firm’s management (Chava and Purnanandam, 2007). The results presented for small firms (Vickery, 2008) suggest that this cannot be a complete explanation, since these patterns are also prevalent amongst small firms, where owner and manager incentives are generally well-aligned.

Table 3: Empirical Evidence on market conditions

Author(s) of Study	Year	Proxy for Market Conditions	Expected Sign	Estimated Sign	Significance
Faulkender	2005	30-1year,5-1year and 10-2 years	Positive	Positive	Significant
Vickery	2008	Yield spread	Negative	Negative	Significant
		Real interest rate	Negative	Negative	Significant
		Quarterly Inflation	Negative	Negative	Insignificant
Faulkender and Chernenko	2007	Term Structure	Positive	Positive	Significant
Rokkanen	2007	Yield Curve(10y-3m)	Positive	Negative	Significant
		3-month Euri-bond	Positive	Negative	Insignificant
Chava and Purnanandam	2007	Average term spread	Positive	Positive	Insignificant

Source: Author

Table 3 summarises the author’s findings and the different measures of market timing

utilised. Although the main focus of this research is about the determinants of floating rate debt, the results presented in Table 3 are quite mixed. Antoniou *et al.* (2009), Faulkender and Chernenko, (2007) and Faulkender, (2005) found a positive and statistically significant relationship between market conditions and floating rate, while the other studies in Table 3 found mixed results. Although different proxies are utilised by different methods, again the results are quite mixed. Most studies use the term structure as a measure of market timing. They use various combinations of long term and short term interest rates. However, little has been said about the inflation rate and real short term interest rate, which could be an alternative proxy or a supplement as robust as market timing.

The only UK study in the area of fixed and floating debt mix was attempted by Antoniou *et al.* (2009), who explain the market timing before debt has been issued and after the debt issues. However, they do not take into account outstanding debt. As a result further exploration on the final outstanding debt in this area is required. Antoniou *et al.* (2009) take into consideration all firms comprising of both financial and non-financial firms. Financial firms do not really need to be considered for the market timing as they already have financial derivative strategies. Hence, further research in the area of UK non-financial firms should be considered. Table 3 summarises the existing evidence on the market timing hypothesis of six studies in the area of floating debt mix. Most of the predictions in column four elaborate the positive predictions with the exception of Vickery (2008). Her dependent variable is opposite to all other studies; that is, fixed rate debt is denoted as “1” and else “0”, and thus a negative prediction expected. Although different proxies are evidenced by these studies, the coefficients are relatively significant at either 1% or 10%. However, the measures of market timing, quarterly inflation, 3-month Euri-bond and average term spread employed by Vickery (2008), Rokkanen (2007) and Chava and Purnanandam (2007)

respectively, are highly insignificant.

3.4.4: Sources of debt

There has been limited research on the sources of debt and their role in determining or influencing floating rate debt mix. As mentioned in Chapter 2 (section 2.4.4, *p. 30*), the two main sources of debt finance are the banks and the public debt market. In an imperfect world, firms face information asymmetry as such firms cannot be fully evaluated by lenders. When lenders are unsure about borrowers, firms may face restrictions to the accessibility of funds from financial institutions to finance their projects.

Firms issue fixed rate debt when future credit prospects are good and swap from floating rate debt to fixed rate debt when their future prospects are bleak. This is explained by Arak *et al.* (1988) who rely on the information asymmetry explanation to decide on the future prospects of the firm. Titman (1992) developed a model of debt maturity structure to explain their debt structure. His analysis suggested that lower rated firms that expect their credit ratings to improve in the future would prefer to borrow short term at a floating rate debt. In order to hedge interest rate risk, they issue fixed rate debt associated with long term debt. Titman (1992) found that firms with favourable inside information borrow at better credit terms and consequently avoid locking into a fixed interest rate until such favourable information is publicly disclosed. Titman (1992) also emphasizes that a firm may issue short term debt to signal management belief that the firm's financial condition is expected to improve. By issuing short term debt and swapping into fixed rate debt, he argues that synthetic fixed rate financing provides firms with the incentive to not only reduce financing costs or default risks, but also make safe and productive long term investments.

Firms can also decide on the optimum mix of bank debt and market debt which can contribute to trade-off theory. Large firms hold all the bargaining power in the sense that they can take or leave the debt services offered by the banks; on the other hand, debt is attractive to small and vulnerable firms. Firms attempt to raise bank based debt first, and then raise capital from the public debt market. Consistent with this prediction, Carey (1995) finds that out of the 18,000 loans issued between 1986 and 1993, more than 99% of all bank loans contained a seniority clause. Once a large firm reaches its bank debt capacity, it is optimal to raise more debt capital through the capital markets. Market debt complements bank debt, providing tax shield benefits beyond those attainable with bank debt only. The existence of market debt distorts the private workout process, with market lenders capturing some of the benefits attributable to bank concessions. Since firms and banks fail to internalise these benefits, the workout process is abandoned prematurely, with bankruptcy costs being incurred. At the optimal debt structure, marginal bankruptcy costs associated with market debt are equated with marginal tax benefits, as in a standard trade off model such as Leland (1994). However, the presence of bank debt raises the marginal bankruptcy cost schedule, lowering the optimal market debt. Trade-off theory predicts that a weak firm or small firm will rely exclusively on banks for debt capital. Within the trade-off theory, there is a debt “pecking order”, with bank debt being preferred to market debt due to the lower implied bankruptcy costs. When banks holds all ex-post bargaining power, the desired level of debt tax shields can be achieved using only bank debt. Consistent with this prediction, Blackwell and Kidwell (1988) document that small firms issue privately placed debt almost exclusively. In contrast, they find that larger firms are more likely to issue market debt. The trade-off theory can also be extended to the floating rate debt mix. Since bank debt tends to be short term by definition, it is therefore more likely to be floating rate. Conversely, debt sourced from the public market, such as foreign bonds and Eurobonds, is

more of a long term nature. These types of debt have a longer term to maturity and therefore are more likely to incur fixed rates of interest. The proxy used by most studies to depict whether firms have access to capital markets is credit rating, as shown in Table 4.

Recently, several studies (Rokkanen, 2007; Covitz and Sharp, 2006; Chava and Purnanandam, 2007; Antoniou *et al.*, 2009; Faulkender and Chernenko, 2006) have focussed partially on the source of debt as a potential determinant of fixed and floating rate debt mix. Their two main sources of debt are bank debt or market debt (capital market) in terms of foreign debt. They employ different proxies to address the issue of source of debt with respect to fixed and floating rate debt. In order to test whether the source of debt is a determinant of a firm's fixed and floating rate debt mix, information such as credit rating and bank based debt are useful. The choice of fixed and floating and sources of debt finance have its importance in this study. Debt sourced from banks would lead to a higher percentage of floating rate debt, whereas debt sourced from the public debt market is more likely to have a fixed rate debt.

Covitz and Sharpe (2006) analyse the debt structure and interest rate derivative positions of non-financial firms (both small and large firms). They examine whether large firms with more public debt have more fixed rate debt. They use the cross tabulation on firms with derivative positions to show that, compared to larger higher rated firms, smaller and lower rated firms have substantially greater interest rate risk exposure from short term and floating rate debt. Thus, firms with longer maturity are more likely to have fixed rate debt. Therefore, the prediction is that firms with a good credit rating have more fixed rate debt than those with a poor or no credit rating. This comparison of debt structure is a recalibration of the widely-cited empirical finding that small low-rated firms are more reliant on short term debt

(Barclay and Smith, 1995; Guedes and Opler, 1996). Flannery (1986) argues that small and lower rated firms are induced to borrowing short term to signal private information about credit quality. In addition, Diamond (1991) suggests that young firms are relegated to borrowing from banks due to reputation concerns. Since banks tend to lend short term and at floating interest rates, this implies that, if all else remains the same, less mature firms would borrow at higher exposure to interest rate risk.

Chava and Purnanandam (2007) also examined whether the source of debt influences the fixed and floating mix. They employed rated debt as a proxy for capital market access. They found that firms with access to the public debt market have less floating rate debt. Antoniou *et al.* (2009) examined the link between actual rating and the fixed and floating rate mix. They employed credit rating to find out whether the source of debt affected the floating rate debt. They moreover, created a dummy variable where an obligation is rated “A” or higher is denoted as “1” for high rating debt else denoted as “0”. In general, there is an alteration in credit rating if firms attempt to reduce their risk exposure on overall debt or on newly issued debt. A change in credit rating can influence the floating rate debt. Antoniou *et al.* (2009) did not find any significant evidence although the coefficient of credit rating has a negative sign.

Faulkender and Chernenko (2007) used the credit spread which is the average of the difference between Moody’s Baa and Aaa rated debt during the fiscal year. In contrast to Chava and Purnanandam (2007) and Antoniou *et al.* (2009), Faulkender and Chernenko (2007) found a positive relationship between the source of debt and floating rate debt.

In a similar study, Rokkanen (2007) employed two credit rating variables. The study employed credit rating variables from both Moody's and Standard and Poor's. He ranked the credit rating and assigned number "1" to the AAA/Aaa to the lowest rating number "7" to CCC/Caa. The second method was to split the firms into those with credit rating and code them as a "1" if the issuer had a credit rating and 0 otherwise. Rokkanen (2007) found that low-rated firms are more likely to have floating rate debt. His finding concluded that unrated issuers prefer bank debt, whereas highly rated firms sporadically tap the public market to access fixed rate debt.

Table 4: Evidence of sources of debt and floating debt mix

Authors	Proxies	Expected Sign	Estimated Sign	Significance
Rokkanen (2007)	Moody's and Standard and Poor's	Positive	Positive	Significant
Covitz and Sharpe (2006)	Standard and Poor's	Negative	Negative	Insignificant
Chava and Purnanandam (2007)	Rating	Negative	Negative	Significant
Antoniou <i>et al.</i> (2009)	S&P Credit Rating	Negative	Negative	Insignificant

Source: Author

The findings of similar studies investigating the relationship between source of debt and the fixed and floating debt mix are summarised in Table 4. It shows the proxy for sources of debt and the expected sign of the respective coefficients and the estimated sign of the coefficients and the significance of the results. The findings show that the results are consistent with the prediction. Table 4 shows that most studies which concentrate on the sources of debt and their relationship with fixed and floating rate debt use credit rating as

their proxy to test whether firms have access to the public debt market. Some studies apply a credit rating as a dummy variable, while others use the actual credit rating (Chava and Purnanandam, 2007; Covitz and Sharpe, 2006; Antoniou *et al.*, 2009).

Ideally, bank loans would also be an appropriate measure for firms but studies have mainly emphasized credit ratings. Further research and analysis should be undertaken with respect not only to fixed and floating rate debt, but more explicitly with regard to capital structure, which is a flaw in the area of UK non-financial firms. Table 4, moreover, demonstrates that the results are inconclusive, since two out of four studies are insignificant (Covitz and Sharpe, 2006; Antoniou *et al.*, 2009).

The research in this paper is closely related to that of Chava and Purnanandam (2007). As shown in their paper, rated firms are less likely to have floating rate debt. Their model concentrates on a two-year sample of firms in the USA. However, this research study is the first of its kind to use UK data to analyse the relationship between floating rate debt ratio, and to use credit rating as a measure of capital market. Most studies have based their attention on economies other than the UK. The only study in the UK used event study with new debt issues (Antoniou *et al.*, 2009). This research is also the first to analyse floating rate debt for both foreign debt only and domestic debt with respect to sources of debt. Moreover, it also accounts for the effect on foreign exposure of debt. This helps to cover all the different aspects of floating rate debt, whether the entire debt or foreign debt.

3.4.5: The costs of financial distress

The review of the theoretical literature in Chapter 2 suggested trade-off theory deals with financial distress and tax advantages of debt financing. A firm's management must decide on the level of financial leverage as excess financial leverage can yield to financial distress. Thus, hedging motives might be an important factor in determining the fixed and floating mix. One of the hedging motives states that firms facing the risk of financial distress are more likely to hedge their positions. Firms can avoid financial distress if they are naturally hedging their exposure. Chava and Purnanandam (2007) employ the cash flow beta, whereas Faulkender (2005) employs interest rate sensitivity, and Vickery (2008) utilises industry interest rate sensitivity. None of these studies found significant results. As such, firms may face financial distress when there is a volatile cash flow due to fluctuation in interest rates. By maintaining a high percentage of fixed rate debt, firms reduce the volatility of their debt service payments and, consequently, lower the probability of financial distress. It follows that firms with higher costs of financial distress prefer a lower percentage of floating rate debt. Several studies attempt to measure the effect of financial distress costs and the choice of fixed and floating debt mix (Chava and Purnanandam, 2007; Rokkanen, 2007; Faulkender and Chernenko, 2006). They use different proxies for the financial distress costs. Chava and Purnanandam (2007) utilise Altman Z-score and leverage as proxies for financial distress, whereas Faulkender and Chernenko (2006) use leverage.

Chava and Purnanandam (2007), Rokkanen (2007) and Faulkender and Chernenko (2006) investigated the relationship between financial distress and fixed and floating rate debt mix. Their results are negative and statistically significant within the limited studies. Chava and Purnandanam (2007) built a dummy variable based on a Z-score benchmark of 1.81. All variables below the benchmark are recoded as "1" and the rest are recoded as "0".

According to Altman (1977), firms are closer to financial distress if the Z-score is below 1.81. Chava and Purnanandam (2007) find that firms which are close to financial distress use a higher share of fixed rate debt, which is consistent with hedging motives. Thus, they conclude that credit-constrained firms, which are closely related to banks, are associated with fixed rate loans. Chava and Purnanandam (2007) employ debt to total asset ratio as an independent variable. Nevertheless, the problem of simultaneity arises because of the direct relationship between floating rate debt and capital structure. Thus, Chava and Purnanandam (2007) reject the idea of using leverage as the base of the specification. They report that smaller firms with more valuable growth options and which are closer to financial distress adopt a more conservative debt financing strategy by maintaining lower levels of floating-rate debt.

Vickery (2008) presents two measures of company debt level: leverage (book debt/assets) and loan size (most recent loan size/assets) with respect to fixed rate debt. She does not find any conclusive results. Antoniou *et al.* (2009) find similar results to Vickery (2008) when considering financial distress. Although Faulkender (2005) employed other proxies such as research and development to sales, advertising expenditures to sales, and capital expenditures to sales, the results were insignificant. These measures can also act as proxy for both underinvestment and financial distress costs (Graham and Rogers, 2002; Geczy, Minton, and Schrand, 1997; Allayannis and Ofek, 1998).

From the empirical review, Table 5 depicts the relationship between financial distress and fixed and floating rate debt. It displays the studies and the proxies related to financial distress together with their respective predictions. According the hedging theory, firms close to financial distress are most likely to hedge their risk. In the same area of understanding, firms close to financial distress are more likely to utilise fixed rate debt.

Table 5: Financial Distress and Fixed and Floating debt mix.

Authors	Proxies for Financial Distress	Expected Sign	Estimated Sign	Significance
Chava and Purnanandam (2007)	Z score Debt to Assets	Negative Negative	Negative Negative	Significant Significant
Faulkender (2005)	R & D to sales Capital Expenditure to Sales	Negative Negative	Negative Negative	Insignificant Insignificant
Vickery (2008)	Book debt/Total Assets Loan Size	Positive Positive	Negative Negative	Insignificant Significant
Faulkender and Chernenko (2006)	Leverage	Negative	Negative	Significant

Source: Author

Table 5 shows the different results of the prediction of the relationship of fixed and floating rate debt and financial distress. All the studies in Table 5 are based in the USA. Clearly there is a lack of research in the UK with respect to financial distress and fixed and floating rate debt. Table 5 shows that only two studies found statistically significant results (Chava and Purnanandam, 2007; Faulkender and Chernenko, 2006). Both studies employed leverage as a proxy for financial distress. One particular problem with leverage and the floating rate debt ratio is the endogeneity problem that can distort the results. Chava and Purnanandam (2007) instrument leverage with the Z score variable and still find a significant negative relationship. However, Faulkender (2005) and Vickery (2008) do not find any statistical significance for financial distress.

Myers and Majluf (1984) suggest that that limited the amount of debt and propose that the optimal leverage ratio of a firm is determined by the trade-off between tax shields with debt financing against higher bankruptcy costs. According to the trade-off theory, profitable firms take more benefit from the tax shield by debt financing because there are fewer chances for

them to go bankrupt; therefore, profitable firms are capable of raising the debt ratio more than less profitable firms. Similarly, firms are more willing to be protected from any risk utilising fixed rate debt to lower fluctuations in their earnings. Thus firms apply risk management techniques to alleviate the risk by utilising less floating rate debt. As in such studies in Table 5, leverage is considered as a key proxy for financial distress and for hedging motives. Higher leverage leads firms to hedge more. As such, leverage can be viewed as a critical factor for the choice of fixed and floating debt mix. Higher levels of leverage tend to be associated with more fixed rate debt as they tend to be closer to the financial distress costs. Hence, firms prefer to avoid fluctuating interest rates. Research in the area of financial distress and fixed and floating rate debt is limited to the USA, of which only two studies suggest that leverage is a key factor for financial distress. Research in the UK context in this area is still uncovered.

3.4.6: Growth opportunities

Studies focussing on growth opportunity and fixed and floating rate debt mix are quite limited. Jung *et al.* (1996) show that firms should use equity to finance their growth because such financing reduces agency costs between shareholders and managers, whereas firms with fewer growth prospects should use debt because it has a disciplinary role (Jensen, 1986; Stulz, 1990).

Myers (1977) shows that firms with growth opportunities may invest sub-optimally and therefore creditors will be more reluctant to lend on a long term basis. This problem can be solved by short term financing (Titman and Wessels, 1988), or by convertible bonds (Jensen

and Meckling, 1976; Smith and Warner, 1979). In such a situation, firms will have more floating rate debt, as short term financing is mainly through banks at a floating rate of interest.

From a pecking order theory perspective, growth firms with strong financing needs will issue securities which are less subject to informational asymmetries, i.e. short term debt. If these firms have very close relationships with banks, there will be fewer informational asymmetry problems, and they will be able to have access to long term debt financing as well. In such cases, firms will issue fixed rate debt and therefore will bear less volatility of interest rates.

Research on growth opportunity has been very limited with respect to it being a determinant of floating rate debt exposure. Chava and Purnanandam (2007) and Antoniou *et al.* (2009) are amongst the few studies which focus on the underinvestment cost in relation to floating rate debt mix, and the results are quite mixed.

Chava and Purnanandam (2007) test the underinvestment hypothesis with the floating rate debt structure. The proxy that was used in their study is market to book ratio and research and development expenditure, scaled in relation to firm size. However, these proxies were not only used for growth opportunities but also used in conjunction with financial distress measures. Chava and Purnanandam (2007) find that small firms, with more growth options, which are also closer to financial distress, prefer to maintain lower floating rate debt. The findings show that the coefficients are negative, which demonstrate that high growth firms appear to have lower floating rate debt. The results follow the same trend as the hedging theory research in this area. For example, Froot *et al.* (1993) point out that research and development can be viewed either as a measure of a firm's intangible assets or of asymmetry of information about the quality of new projects. Froot *et al.* (1993) suggest that it might be more difficult for research and development intensive firms to raise external financing such

as borrowings. This is because lenders do not view these firms' assets as quality collateral, or because there is likely to be greater asymmetric information about the quality of new projects. Also, borrowing constraints that result from asymmetric information might increase the probability of financial distress. Therefore, a firm's growth opportunity and research and development expenditure could also be proxies for costly external financing or financial distress.

Antoniou *et al.* (2009) apply market to book ratio as a proxy for growth opportunity. However, the results are not consistent with that of Chava and Purnanandam (2007). They found that market to book ratio is positive and insignificant, and therefore does not fit the model.

Faulkender (2005) uses research and development to sales, advertising to sales, and capital expenditure to sales as proxies for underinvestment costs. Apart from advertising to sales, which is significant with the expected sign (negative), both capital expenditure to sales and research and development to sales were found to be statistically insignificant. The measures can also have potential distress costs. As costs increase, firms may become more concerned about interest rate fluctuations and this may force such investment expenditure to be reduced at times of distress and therefore impact on the interest rate exposure.

Table 6: Underinvestment costs and floating debt mix

Authors	Proxies for Underinvestment costs	Expected sign	Estimated sign	Significance
Chava and Purnanandam (2007)	Book to market ratio	Negative	Negative	Insignificant
	Research and Development to Assets	Negative	Negative	Insignificant
Antoniou <i>et al.</i> (2009)	Market to Book ratio	Negative	Positive	Insignificant
Faulkender (2005)	R&D to sales	Negative	Negative	Significant
	Advertising to sales	Negative	Negative	Significant
	Capital expenditure to sales	Negative	Negative	Insignificant

Source: Author

Table 6 summarises the studies employed in the area of fixed and floating debt mix with respect to growth opportunity as control variable. Chava and Purnanandam (2007) have the only study that utilised book to market ratio and research and development scaled to sales as proxies for underinvestment costs. Their results were as expected (negative). The findings suggested that firms with more growth opportunity prefer to have less floating rate debt. However, Antoniou *et al.* (2009) failed to find any significant proxies for the underinvestment costs but this may be due to the quality of the data. Chava and Purnanandam (2007) make use of outstanding debt in the USA, whereas Antoniou *et al.* (2009) concentrate on new issues in the UK. However, there is a lack of research regarding non-financial firms in the UK with outstanding debt. Furthermore, research and development scaled to sales, and advertising scaled to sales, are significant at 1% and 10% levels respectively in Faulkender (2005). However, all proxies employed by other studies in

Table 6 were insignificant. As a result, a review of this determinant is required and will therefore be reviewed in this study.

3.4.7: Firm size

Firm size is common in empirical corporate finance studies as a control variable. Intuitively, firm size matters for a number of reasons. In the presence of the non-trivial fixed costs of raising external funds, large firms have cheaper access to outside financing (Leary and Roberts, 2004). Larger firms are more likely to diversify their financing sources and hence their cash flows are less volatile. Alternatively, size may be a proxy for the probability of default, for it is sometimes contended that larger firms are less likely to fail and more difficult to liquidate (Shumway, 2001). Size may then be inversely related to the probability of bankruptcy (Titman and Wessels, 1988; Rajan and Zingales, 1995). Ferri and Jones (1979) suggest that large firms have easier access to the markets and can borrow with more favourable conditions. For small firms, the conflicts between creditors and shareholders are more severe because such firms tend to have large shareholders and are better able to switch from one investment project to another (Grinblatt and Titman, 1998). However, this problem may be mitigated with the use of short term debt, convertible bonds, as well as long term bank financing. Most empirical studies to date have reported a positive sign for the relationship between size and leverage (Rajan and Zingales, 1995; Frank and Goyal, 2006; Booth *et al.*, 2001). Less conclusive results are reported by other authors (Kremp *et al.*, 1999; Ozkan, 2001).

Firm size is also an important factor in determining the choice of fixed and floating rate debt mix. Larger and more profitable firms are more likely to have fixed rate debt, while smaller, less profitable firms are more likely to have floating rate debt. The reasoning is that

larger firms have access to the bond markets, have a good reputation with respect to the capital markets, and are more reliable compared to small firms. Several studies which focus on the floating rate debt mix utilise size as a determinant or they use it as a control variable (Chava and Purnanandam, 2007; Faulkender, 2005; Rokkanen, 2007; Covitz and Sharp, 2005; Antoniou *et al.*, 2009; Vickery, 2008).

The findings regarding firm size as measured by the logarithm of sales are a significant determinant and are consistent across studies within the literature (Faulkender, 2005). Diamond (1991) argues that banks are better at piercing the information asymmetry between firms and lenders, or perhaps they monitor firms better than the market does. Larger firms are more likely to borrow from the public market, whereas smaller firms will favour banks. These results are consistent with the empirical findings of Cantillo and Wright (2000) and Faulkender and Petersen (2003), who find that as sales increase, firms are less likely to borrow from banks.

In line with the expectation of firm size, Rokkanen (2007) find that log of total size is statistically significant. It, therefore, demonstrates that larger firms are more likely to issue fixed rate debt. This is also consistent with findings presented by Faulkender (2005) and Covitz and Sharpe (2005). Consistent with Rokkanen (2007), Antoniou *et al.* (2009) used the market value as a measure of firm size to illustrate that larger firms are more likely to use fixed rate debt and vice versa. Chava and Purnanandam (2007) found that firm size (log of sales) is negatively correlated with floating rate debt ratio. This is consistent with Barclay and Smith (1995), who found a negative association between firm size and short term debt. Finally, Vickery (2008) who studied small firms, employs $\log(1+\text{assets})$ as a proxy for firm

size, and shows that the smaller and younger firms are, the more likely they are to match fixed rate loans, which is in line with the other research conducted in this area.

Table 7: Evidence of Firm Size and Floating debt mix

Authors	Proxy For firm Size	Expected sign	Estimated Sign	Significance
Faulkender (2005)	Log of sales	Negative	Negative	Significant
Rokkanen (2007)	Total Size	Negative	Negative	Significant
Antoniou <i>et al.</i> (2009)	Log Market Value	Negative	Negative	Significant
Chava & Purnandam (2007)	Log of Sales	Negative	Negative	Significant
Vickery (2008)	Log Assets	Negative	Negative	Significant

Source: Author

Table 7 shows that different studies attempt to find out whether firm size has an impact on the floating rate debt choice. Although different proxies were utilised by different authors, the results were all negative and statistically significant. This strongly suggests that large firms prefer to have less floating rate debt.

3.5: Conclusion

This chapter reviewed the empirical research on the determinants of fixed and floating rate debt mix. The review began by looking at the definition of fixed and floating rate debt and how it is measured. Studies have examined different measures of fixed and floating debt mix, the final floating rate debt ratio and the use of the dummy variable (floating rate debt as “1” and fixed rate debt as “0”). Chava and Purnanandam (2007) and Faulkender and

Chernenko (2007) focused on the floating rate debt percentage after manually accounting for swaps usage. Thus, this thesis follows the method employed by Chava and Purnanandam (2007) with respect to the calculation of floating rate debt ratio and is the first of its kind to utilise UK data.

The majority of empirical studies utilise a variety of proxies and measures when examining the fixed and floating rate debt mix. Faulkender (2005) focused on only the final interest rate exposure of chemical firms and tested whether firms are hedging or timing the market in choosing the debt. Faulkender's results show firms are timing the market instead of hedging. This result is industry specific and therefore may not be representative of all the industries in a particular country. Antoniou *et al.* (2009) examined new debt issues. They analysed new deals to identify whether they are fixed or floating rate and compared the results before and after the debt was issued by using an event study. Their results demonstrated that there was no evidence regarding interest rate exposure with respect to levels of floating rate debt. Moreover, they found that firms have more incentive to issue floating rate debt when inflation and short term interest rates were high and term structure was steep. This result was similar to that presented by Faulkender (2005). However, they considered only new debt issues and failed to consider outstanding debts. They also failed to consider the sources of debt, which may impact on the decision of fixed and floating rate debt. Another aspect where the study of Antoniou *et al.* (2009) falls short is financial distress in this area of research.

Chava and Purnanandam (2007) studied the floating to fixed debt mix and based their sample on 1800 public companies. They found that firms close to financial distress used a higher share of fixed rate debt, consistent with the results of Rokannen (2007) that credit

constrained firms are associated with fixed rate loans. A notable point of difference, however, was that Chava and Purnanandam (2007) found that managerial and corporate governance variables, particularly the incentives facing a firm's CFOs, tend to be a key determinant of a firm's floating rate debt ratio. Related research found that managerial characteristics also play an important role in the decision to hedge using derivatives (Rogers, 2002; Tufano, 1996). Nevertheless, Chava and Purnanandam (2007) were unsuccessful in their study which was to consider inflation and short term interest rates as a market timing strategy. Moreover, the reliability of the dependent variable was questionable since manual adjustment is more prone to mistakes. In contrast, Rokannen (2007) found that owner and manager variables are relatively unimportant in determining the interest rate exposures of small firms.

With regards to the source of capital, Faulkender (2005), Chava and Purnanandam (2007) all noted that bank loans are significantly more likely to involve floating interest rates than public debt funding. However, they used credit rating as a proxy for firms having access to public debt but failed to use bank loans as a proxy for bank dependent firms. Chava and Purnandam (2007) found that firms with a public debt rating (a proxy for greater reliance on public debt rather than bank loans) have a 36% higher fixed rate share. Faulkender (2005) found a positive relationship between firm size and fixed rate exposures, which he argued reflects the point that large firms acquire more of their debt from public markets. Neither Chava and Purnandam (2007), nor Faulkender (2005), suggested any explanation for this fact; however, Rokannen (2007) presented evidence that bank loans are more likely to be involved in floating rate debt when compared to other private sources of finance. He also proposed a unified explanation for these facts, arguing that depository institutions originate

a higher share of adjustable rate debt as a way of ameliorating exposure to maturity mismatch and ‘bank lending channel’ of monetary policy.

Faulkender (2005) focused on the incremental debt issuance decision of the firm, whereas, Chava and Purnanandam (2007) studied the determinants of the floating to total debt ratio of outstanding debt. The advantage of the Faulkender (2005) study was to relate the debt issuance decision more precisely to market timing versus hedging considerations; such studies cannot capture the entire information of corporate borrowings. However, a particular problem with incremental debt is that it is not captured easily as there are revolving loans. Since borrowings do not have a specific withdrawal date, they are not captured in the incremental debt issuance study by Faulkender (2005). Denis and Minhov (2003) point out, incremental borrowing decisions might represent a temporary deviation from a firm’s optimal mix of debt claims.

The studies reviewed in this chapter considered the fixed and floating rate debt mix from different perspectives but failed to consider the currency composition of the floating rate debt ratio, which might be a tool for management regarding their position on how much foreign debt a firm should issue. Following the issue of foreign debt, we can also exploit the percentage of foreign floating rate debt that a firm issues and what factors determine this. Since outstanding debt is considered in this study, it does not prevent consideration of the changes in the outstanding debt which can be seen as incremental debt.

Following the numerous research studies on capital structure (*p 46*) which show either a uniform type of debt or different types of debt such as secured and unsecured debt, this research attempts to find the heterogeneity of debt by focussing on fixed and floating rate debt. According to the researcher’s knowledge, this is the first study of its kind to focus on capital structure and the heterogeneity of the types of debt and, more specifically, fixed and

floating debt. This chapter identifies a number of additional research issues, expressed in the form of questions, which require consideration in order for an empirical investigation to be undertaken.

These questions are:

1. What are the main factors affecting the fixed and floating rate debt mix?
2. Are firms hedging or timing the market?
3. Does the composition of currency mix affect the floating rate debt ratio?
4. Do credit ratings affect the floating rate debt ratio?

In summary, the review demonstrates that there are gaps in the empirical literature since most of the studies on fixed and floating rate debt have been conducted outside the UK, with the exception of Antoniou *et al.* (2009) who only conducted an event study. Currently there are no studies investigating the determinants of fixed and floating rate debt using UK company level data with particular reference to outstanding debt. This review of empirical literature argues that several studies are flawed because they do not manage to find any significance with respect to the natural hedging hypothesis and that the signs were not as predicted, which could be a major drawback of these studies. This discussion also suggests that the financial distress hypothesis, the sources of debts and underinvestment cost hypothesis have not been adequately tested. Issues such as currency mix of floating debt have not been addressed in this area of research and therefore need consideration as they may prove to be of value. Furthermore, a further criterion that has some importance is the change in the floating debt that the literature has hardly focused on. An examination of all the issues reviewed in this chapter will be analysed in the remaining chapters.

Chapter 4: Data and Disclosures of Non-Financial Firms in UK

4.0: Introduction

The review of the empirical literature in Chapter 3 identified several factors that have been considered as potential determinants of the floating rate debt. Chapter 3 provides a detailed review of the proxies employed by other studies, which mostly concentrate on other countries. Using a novel dataset of UK non-financial firms, this chapter attempts to explain the main variables utilised with their respective sources. The UK provides a particularly valuable focus for empirical investigation since it has a large and sophisticated corporate sector. Furthermore, the lack of consensus on the fixed and floating debt mix of outstanding debt in the UK provides the motivation for this study.

This chapter explains the data selection process and examines the characteristics of the firms included for this research. It defines and gives the measurement of the variables employed in this study. This chapter also explains the source of the data and provides detailed descriptive statistics of the fixed and floating rate debt collected from annual reports. The layout of this chapter is as follows:

The first section describes how the sample is constructed. It then goes on to discuss from where the data on fixed and floating debt mix is sourced, explaining the type of data collected, and how. The second section presents a description of the variables and their measurements. The third section (4.3) examines the disclosure practices of the main variables involved in the study for this sample FRS 13. Finally, the chapter summarises the chapter.

4.1: Data

This section discusses the construction of the sample data that is assigned for this study and the main disclosures of fixed and floating debt mix practices of UK non-financial firms post FRS 13. It also explains the choice of the sample firms and describes the data collection process.

4.1.1: Sample

The sample database for this study comprises firms quoted on the Financial Times Stock Exchange, the largest UK firms. Largest firms are taken into considerations in this study as small firms are not well equipped enough to have the qualities of large firms. For example, small firms do not have the required products for risk management. The choice of this sample (the largest firms) is made by ranking firms with the highest market capitalisation where the lowest market capitalisation is £1000m, and focuses on only non-financial firms. Firms from the financial services industry are excluded from the sample because of their risk management activities, which include both hedging and speculative transactions, compared with non-financial firms, assumed to conduct only hedging transactions.

The sample of firms used starts with the year 1999, as the new disclosure regulations of the FRS13⁹ came into force in that particular year. Prior to the FRS 13, firms were not required

⁹ The disclosure would also typically include a description of the main financial risk management and treasury policies agreed by the directors, including the policies, quantified where appropriate, on:

- e) the fixed/floating split, maturity profile and currency profile of financial assets and financial liabilities;
- f) the extent to which foreign currency financial assets and financial liabilities are hedge to the functional currency of the business unit concerned;
- g) the extent to which foreign currency borrowings and other financial instruments are used to hedge foreign currency net investments; and
- h) any other hedging

to disclose the information such as the composition of debt structure in their balance sheet. Non-financial firms are selected from the year 1999 and then ranked with the highest market capitalisation. The same firms are accounted for in the years following: 2000 - 2004. The number of firms for the year 1999 is 458, dropping to 385 in 2004. The main reasons explaining the decrease in the number of firms is mainly due to mergers, takeovers and acquisitions and the variation in the firms in each particular year is due to the availability of the annual reports gathered at that particular point in time. The advantage of this sample is that large firms quoted on the stock exchange are more likely to have exposure to financial price risks and are actively encouraged to report their activities in their financial statements during the sample period.

4.1.2: Sources of data

The empirical literature in Chapter 3 indicates that reliable data on fixed and floating debt mix is of paramount importance in any empirical investigation. It is essential to mention that there are relatively few studies in this area of fixed and floating debt mix. This has been hindered by the general unavailability of data on firms' activities. Chapter 3 highlights the measures taken in collecting publicly available data on interest rate debt mix. It also shows that most of the earlier studies used different methods of collecting data. Dealscan was employed by Faulkender (2005), and Chava and Purnanandam (2007), while Antoniou *et al.*, (2009) downloaded their information from SDC Platinum. Moreover, Chernenko and Faulkender (2007) extracted information from the Compustat databases, whilst Rokkanen (2007) downloaded his data from Dealogic databases. In the UK, data are disclosed in annual reports following the FRS 13. This means that there have been improvements in the disclosure of information with respect to the fixed and floating rate debt for outstanding

debts. Thus, this study take into account only large firms and the data are sourced from different databases and annual reports. Data hand collected from annual reports are mainly; floating rate debt, fixed rate debt, currency composition of floating rate debt, foreign debt , domestic debt, interest rate swaps, foreign currency derivatives, short term debt to maturity, long term debt to maturity, foreign sales, domestic sales, foreign financial assets, domestic financial assets and sterling debt. Firm characteristics¹⁰ are collected from DataStream and credit rating is collected from Standard and Poor's.

4.1.3: Annual report data

In this study, data are hand collected from annual reports which are published for the period 1999 to 2004. A specific format (template) was prepared to facilitate the data collection and data sourced from annual reports filled in using this standard format. Then, data from the template were transferred to Data Entry software and finally to the final dataset. In order to be able to complete these templates accurately, exhaustive and careful reading and understanding of the accounting disclosures was required.

Two concerns may arise while collecting data from annual reports. Firstly, there is the possibility of inconsistent interpretation of information and, secondly, the misclassification of firms. The first concern was mitigated by checking the data thoroughly after entering the data in the templates. Furthermore, checks were made to ensure that each firm's data was interpreted consistently by referring to this key information. The data cleaning process involved checking the data once it had been entered (effectively entering the data twice) and undertaking simple frequency analysis on each of the variables. For example, a firm having a floating debt ratio cannot be more than 100%. The frequency analysis would highlight any

¹⁰ Firms characteristics in this study are: total assets, current assets, market to book value, return on investment, total sales, total debt, market value of equity, capital expenditure to total assets, capital expenditure to total sales, market capitalisation, cash ratio, interest rate for EU, US and UK treasury bills

inconsistency which would be checked and then corrected. The second concern was mitigated by using explicit definitions which were referred to in cases of potential misclassification.

The advantage that annual reports have over databases (small business finance (SBF) and SDC Platinum) used by other studies (Antoniou *et al.*, 2009, Vickery, 2008, and Faulkender, 2005) is that the notes to the accounts give a breakdown of information which can be cross checked by using simple descriptive statistics and they are, perhaps, a more reliable source of information. For example, they give a breakdown of fixed and floating rate debt where the total of the debt structure equals the total maturity profile of debt. Furthermore, we assume consistency in the interpretation of information contained in annual reports, given that it is collected by a single researcher. The major drawback is that the information they contain is often of limited scope and varies greatly from firm to firm, although both the content and consistency of disclosure have improved as mandatory requirements have evolved. For example, the sum of the percentage of fixed debt, floating debt and that of non interest bearing liabilities should be 100%. While doing these checks, if the sum is greater or less than 100%, then the particular information is cross checked from the annual reports to find out if there are any discrepancies. This type of check is for verification; if ever any issues are flagged up, the data are cleaned.

4.2: Definition of variables

4.2.1: Measuring floating rate debt ratio as the dependent variable

The review of empirical literature identified the different ways that previous studies measured the fixed and floating debt mix. The fixed and floating rate debt mix can be measured by dummy variables or by floating debt ratio. The dummy variable can be formed

when firms issue floating rate debt, denoted as “1”, and “0” otherwise (Antoniou *et al.*, 2009; and Rokkanen, 2007). In Vickery’s (2008) study, fixed rate debt is denoted as “1”, and “0” otherwise. Chava and Purnanamdam (2007), and Faulkender and Chernenko (2007) employ the ratio of floating rate debt ratio. They selected firms from the Compustat and CSRP databases respectively and manually adjusted for the use of interest rate swaps to compute the final floating rate debt. In this study, the fixed and floating debt mix of all outstanding debt for a firm’s financial year end are calculated without the need to adjust for derivatives. This has been made possible because, since the year 1999, firms are required to disclose their financial liabilities in their reports post the FRS 13. Therefore, this enables us to construct the floating rate debt ratio in this study. The method that we utilise in this study as the dependent variable is to scale total floating debt after derivatives to total financial liabilities, following Chava and Purnanandam (2007). This is dealt with for each firm in the sample and is repeated for each year. It should be noted that annual reports are read carefully so that data are carefully collected after the use of derivatives is collected. Hence, there is no need to adjust for derivatives for this dataset. This enables us to calculate the percentage of total outstanding debt that is floating after derivatives, which takes into consideration both short term floating rate debt and long term floating rate debt. Hence, the total floating rate debt ratio is calculated as follows:.

$$\text{Total Floating rate debt ratio} = \frac{\text{Total Floating Rate Debt}}{\text{Total Debt}} \quad - \text{Equation (1)}$$

The notes to the accounts, for the borrowings section in the annual report, present a breakdown of how much debt is floating and how much is fixed. They also provide a currency profile of a firm’s debt. These data are reported after the use of derivatives. We are also able to calculate this percentage for both floating rate debt ratio and domestic floating

rate debt ratio¹¹ in which the firm holds debt. For example, the dependent variable in chapter 7 is foreign floating rate debt ratio is calculated as follows:

$$\text{Foreign Floating Rate Debt Ratio} = \frac{\text{Total Foreign Floating debt}}{\text{Total Debt}} \quad - \text{Equation (2)}$$

Chapter 2 suggests that the decision of the fixed and floating debt mix depends on various firm-level characteristics and certain macro-economic factors. It argues that the benefits of fixed and floating debt following the theories of capital structure (trade off theory, information asymmetry and agency cost theory) are likely to differ across firms in ways that depend on their very own characteristics. These characteristics and their relation to fixed and floating debt mix were examined in the review of the empirical literature in Chapter 3, which identified to what extent these factors are considered important and relevant in the process. This section takes on board this analysis and describes the observable indicators within the UK context. In particular, this section describes and defines the main variables employed in this thesis, including a detailed explanation of the calculation method.

4.2.2: Measuring the independent variables.

4.2.2.1: Hedging motives.

In this study, we argue that when it comes to natural hedging, the corporate treasurer will attempt to match the interest rate profile of its debt to that of its financial assets (such as cash and short term investments) in the first instance. Although a number of financial products are available for managing interest rate risk, firms may not always hedge their

exposure, or, in certain cases, may use an operating (internal) strategy to reduce exposure to interest rates.

According to the hedging theory, the management of interest rate risk involves restructuring a company's assets and liabilities in a way that minimises interest rate exposure. One of the strategies that a firm can utilise is netting. A firm can aggregate all positions, both assets and liabilities, to determine the net exposure. If a company has interest bearing investments of £50 million and a loan of £100 million, for example, then the company would only hedge the net exposure of £50 million, as the interest rate risk on the investment would offset the risk on the loan.

Information on the interest rate profile of the firm's cash and short term investments will by definition be tied to short term and variable rates of interest. Therefore, a fairly simple exercise would be for a treasurer to match, in absolute terms, the amount of debt tied to floating rates with the amount of cash and short term investments. Thus, firms with more cash and short term investments relative to debt, the more floating rate debt. This is achieved through the management of interest rate risk. In this study, we use the ratio of total financial assets to total debt. As a proxy for natural hedge we expect to find the more financial assets a firm possesses relative to its debt, the higher the percentage of floating rate debt. Treasurers are more likely to carry out this matching of financial assets and financial liabilities when they have more financial assets.

4.2.2.2: Hedging motives.

When firms decide to have foreign debt, then the use of foreign currency derivative considerations and institutional borrowings costs should be decisive. Although the quantity

of bonds issued in a given currency will be determined solely by the capital needs of issuers, firms prefer to alleviate their risks through foreign currency derivatives. As a result, whether firms have foreign debt or foreign floating rate debt, foreign currency derivative is essential for any firms to manage their risk. As such we expect a positive sign between foreign debt and foreign currency derivative. This study denotes “1” for currency derivative and “0” otherwise. This variable is hand-collected from the notes to the account of the annual report of each firm for the six years, 1999 - 2004.

4.2.2.3: Measuring source of debt.

As discussed in Chapter 3 (*p.69*), credit rating is a proxy to the source of debt when firms have access to the public market to finance their investment activities. Under asymmetric information, firms have better information than lenders. Firms may be restricted to banks or have access to capital markets when they have better credit quality. Firms accessing capital markets are normally more transparent and have good future credit prospects (Arak, Estrella, Goodman and Silver, 1988). Such firms normally issue fixed rate debt as they prefer long term debt. Firms having a credit rating are considered to be more reliable compared to those that do not. Large firms normally have access to credit rating as they have all the requirements necessary to be rated. However, some firms may have the necessary requirements to be rated but fail to have credit due to refusal. The remaining firms simply do not have the necessary requirements to be rated. Credit ratings are sourced from Standard and Poor’s. The dummy variable for firms having a credit rating is denoted as “1”, and firms not having a rating are treated as “0”. This means that firms depending mostly on bank based debt have a zero, whilst firms having “1” have access to public funds. The latter can also have some debt sourced from banks on a short term basis.

Since banks are better at piercing the information asymmetry between firms and lenders, the more transparent firms should borrow from the public market, whereas opaque firms should borrow from banks. Thus, the predicted sign of the coefficient of the credit rating in this study is expected to be negative with respect to the floating rate debt.

4.2.2.4: Cost of underinvestment

According to the pecking order theory, growth firms with strong financing needs will issue less security subject to informational asymmetries. Firms with less information asymmetry and good credit quality are more likely to access long term debt financing. Also when growth firms have access to capital market and have a good repayment capacity, in such cases, firms will issue fixed rate debt and bear the volatility of interest rates less. The hypothesis that has been put forward is that firms having more growth opportunity are less likely to have floating rate debt ratio. Several proxies are employed for growth opportunity firms, as per Table 6 in Chapter 3 (p. 81). Among the proxies, this study employs capital expenditure to sales, following Faulkender (2005).

The intensity of capital expenditure is calculated as a ratio of payment for fixed assets over total sales. Moreover, a close proxy for capital growth opportunity is capital expenditure as a ratio of total assets. Equation 3 shows the calculation of capital expenditure to sales:

$$\text{Capital Expenditure to Sales} = \frac{\text{Capital Expenditure}}{\text{Total Sales}} * 100 - \text{Equation (3)}$$

4.2.2.5: Expected costs of financial distress.

The trade off theory argues that financial distress is a key aspect of capital structure. It stipulates that firms with more debt are more likely to face financial distress. Thus, the choice of fixed and floating rate debt can be impacted by financial distress costs. Chapter 3 (p.75) argues that firms with high leverage are more likely to have low floating rate debt. It also argues that while attempting to consider the expected costs of financial distress empirically, it is difficult to measure these costs directly. These include direct bankruptcy costs pertaining to the administration of bankruptcy, and indirect costs, such as those engendered by a loss of consumer confidence, thereby, leading to a low demand for a firm's products. Most studies reviewed in Chapter 3, therefore, use probability indicators for encountering financial distress as proxies for the expected costs of financial distress. The most popular measure in all studies is leverage (Vickery, 2008; Faulkender and Chernenko, 2007; and Chava and Purnanadan, 2007) and is measured as the ratio of a firm's total debt to total value of assets. The study argues that the leverage ratio can be a factor that can influence the fixed and floating debt; however, there are other measures, such as Z-score. As depicted by the literature review, Z-score is used as a proxy for financial distress (Chava and Purnanandam, 2007). Following Chava and Purnanandam (2007), this thesis uses the Z-score measure to proxy for financial distress. We use the Taffler's Z-score formula, which is relevant in the UK setting (O'Regan, 2002). The Taffler Z-score is calculated using the formula in Equation 4

The formula for Taffler's model is:

$$Z = 0.53X_1 + 0.13X_2 + 0.18X_3 + 0.16X_4 - \text{Equation (4)}$$

X_1 = Profit before tax / Current Liabilities

X_2 = Current Liabilities / |Total Liabilities

$X_3 = \text{Current liabilities} / \text{Total assets}$

$X_4 = \text{Immediate assets} - \text{Current Liabilities} / \text{Operating costs} - \text{depreciation.}$

The benchmark used for detecting success or failure according to O'Regan (2002) is close to 0. Companies with positive score are unlikely to fail, while companies with negative score demonstrate the same symptoms as companies that have failed in the past. Hence, firms having a Z-score lower than 0.2 are less likely to have a floating rate debt since firms try to avoid a risk to changes in interest rates that will give rise to a negative prediction.

Chava and Purnanandam (2007) argue that firms with a higher likelihood and therefore the expected costs of financial distress have less floating rate debt. Thus, lower floating rate debt means higher fixed rate debt, which lowers the variability of debt service payment. This study works out the changes in Z-score, which is the difference between actual and previous year. Z-score change can be either positive or negative. A positive change in Z-score means that there is an improvement in the firm and so less likely to face bankruptcy costs. A negative "Zcha" means that the firm's Z-score has deteriorated. As a result, firms with a positive change in Z-score are more likely to have floating rate debt.

4.2.2.6: Debt to maturity.

The maturity structure of a firm's debt has a significant impact on its fixed and floating debt structure, following Guedes and Thompson (1995), who argue that a positive correlation between a firm's cash flow and interest rates favours floating rate debt. However, as debt to maturity increases the long run, correlation may be less obvious and fixed rate is preferred. According to the signalling theory, interest rate sensitive debt with predictions by Flannery (1986) states that higher quality firms issue shorter maturity debt to signal their quality, while longer maturity debt is more likely to be issued with fixed coupon payments. This

suggests that higher quality firms issue floating rate, short term debt. Short term debt to maturity is short term debt scaled to total debt outstanding. The long term debt is simply long term debt scaled to total debt. These two measures of debt to maturity are both sourced from annual reports and calculated as follows:

$$\text{Short term debt to maturity} = \frac{\text{debt maturing within 1 year}}{\text{total debt}} - \text{Equation (5)}$$

$$\text{Long term debt to maturity} = \frac{\text{debt maturing after 5 years}}{\text{total debt}} - \text{Equation (6)}$$

4.2.2.7: Firm size.

Chapter 3 (p.82) argues that there is a relationship between size and fixed and floating debt mix. Generally, large firms have already been through the process of having short term debt and have built on their credibility by having short term loans; now they can afford to have access to the capital market. Likewise, firms having high turnover and high total assets are more stable and have the tendency to have more fixed rate debt. Thus, in this study, total sales (WC01001) and market capitalisation (WC08001), sourced from DataStream, is utilised.

4.2.2.8: Profitability .

According to the pecking order theory, Donaldson(1961) states management strongly favoured internal generation as a source of new funds, even to the exclusion of external funds. One implication with the pecking order theory is that highly profitable firms that generate high earnings are expected to have less debt capital than those that are not very profitable (Kester, 1986; Friend and Lang, 1988; Rajan and Zingales, 1995; and Wald,

1999). Following the pecking order theory, firms that have more retained earnings are in a better position to face fluctuations in interest rates since they have less debt. Firms with less debt are less likely to face financial distress, and thus prefer floating rate debt. As a result, firms having more earnings are more likely to have floating rate debt. This rationale predicts a positive relationship between profitability and floating rate debt. The reasoning is that profitable firms can use these profits as a buffer in any circumstances where there is a change in interest rates. Moreover, less profitable firms will lead to bankruptcy if there is a similar change in the rate of interest. In this study, return on equity (WC08301), which is sourced from Datastream, is utilised as a proxy for profitability.

4.3: Risk management disclosure practices of UK non-financial firms after FRS 13

Financial Reporting Standard 13 (FRS 13) requires firms to disclose their financial holding of both assets and liabilities in annual reports in the United Kingdom. This involves firms reporting on the currencies in which these assets and liabilities are held, and whether they are held at fixed interest rates, floating interest rates or whether they are non interest bearing liabilities. The disclosures, therefore, allow us to estimate the proportion of a firm's debt that is fixed or floating not only for the total debt but also by currency mix. This section give a detailed descriptive analysis on the number of firms focussing on currency debt, as well as the amount of debt allocated by each of the main currencies for the sample period 1999-2004. It also shows the percentages of fixed and floating rate debt for the same sample of firms. The section also describes the amount of fixed rate debt by each of the main currencies. It finally gives an overview of the behaviour of fixed debt with respect to industry.

4.3.1: Firm holdings and financial liabilities.

This section presents the number of firms by currency and percentages relative to holdings of financial liabilities(debt).

Table 8: Number of firms holding financial liabilities by currency

		Sterling	USD	Euro	Yen	Aus \$
Liabilities 1999	N	251	138	110	13	28
	Percent	82.84	45.54	36.30	4.29	9.24
Liabilities 2000	N	250	157	134	17	26
	Percent	82.51	51.82	44.22	5.61	8.58
Liabilities 2001	N	222	149	117	20	23
	Percent	73.27	49.17	38.61	6.60	7.59
Liabilities 2002	N	234	152	138	20	23
	Percent	77.23	50.17	45.54	6.60	7.59
Liabilities 2003	N	246	149	137	18	25
	Percent	81.19	49.17	45.21	5.94	8.25
Liabilities 2004	N	245	148	139	19	25
	Percent	80.86	48.84	45.87	6.27	8.25
Liabilities	Total number of firms	303	303	303	303	303

Source: Author

Table 8 shows the number of firms holding debt across a range of currencies during the period 1999-2004. In order to make valid comparisons over the period, only 303 common firms are taken into consideration. It shows the number of firms and the percentage number of firms having financial liabilities in sterling, US dollars, EURO and other currencies. It should be noted that in Table 8, firms having debt in sterling also have other liabilities in other currencies. Of these, the percentage number of firms having sterling debt varies from 73% to 82.84% during the six-year period, while the number of firms with US dollar debt varies between 138 firms to 157 firms. The number of firms having Euro debt is consistent over the year 2000 and years 2002-2004. However, the figures in 1999 and 2001 are quite low compared to those mentioned above. This may be due to the fact that some accountants do not disclose previous year data in their annual reports.

Although the number of firms having debt in different currencies is important to consider, the percentage of the amount of debt in different currencies has some significance in this study for the evaluation of the fixed and floating rate debt mix. Table 9 displays the total amount of debt and the percentages of debt for each year by currency. At first glance, the percentage of the amount of debt in sterling is relatively higher than other currencies in all years. The US dollar debt is the first foreign debt that the 303 common UK firms are more likely to issue, followed by Euro, Yen and Australian dollar debt respectively. The total amount of debt for the year 1999 is £210,103m, which increases till year 2003 and then slightly decreases. The same trend is depicted for the amount of debt in sterling and US dollars. This information on specific debt will be utilised in chapter 7 which determine the currency floating rate debt.

Table 9: Value and percentage of financial liabilities by currency

		Sterling	USD	Euro	Yen	Aus \$	Total
Liabilities							
1999	Amount (£M)	100,583	61,244	15,704	351	794	210,103
	Percent	47.87	29.15	7.47	0.17	0.38	
Liabilities							
2000	Amount (£M)	107,994	94,478	22,266	636	795	268,068
	Percent	40.29	35.24	8.31	0.24	0.30	
Liabilities							
2001	Amount (£M)	138,641	61,236	20,317	578	398	239,358
	Percent	57.92	25.58	8.49	0.24	0.17	
Liabilities							
2002	Amount (£M)	169,296	96,010	32,383	833	411	317,212
	Percent	53.37	30.27	10.21	0.26	0.13	
Liabilities							
2003	Amount (£M)	194,719	97,568	73,241	278	384	405,716
	Percent	57.32	27.14	20.33	0.08	0.39	
Liabilities							
2004	Amount (£M)	170,771	79,758	73,768	127	288	363,832
	Percent	46.94	21.92	20.28	0.03	0.35	

Source: Author

4.3.2: The interest rate profile of financial liabilities

This section presents the interest rate profile of the financial liabilities for the period year 1999-2004. It demonstrates the behaviour of the mean of the fixed, floating and non interest bearing debt across the years. The fixed rate debt is determined by the quotient of fixed rate debt to total debt. This ratio is repeated for each firm and for each year in the database. Similarly, the same approach is used to determine the floating rate debt ratio (floating rate debt divided by total debt) which is a variable that is used as the dependent variable in chapter 7 and the non interest bearing liabilities ratio (non interest bearing liabilities divided by total debt). Table 10 demonstrates that the fixed rate debt ratio has a mean of 42.94% for the year 1999, decreasing to the lowest point of 36.31% in 2002, and stabilising in the forthcoming years, 2003 and 2004. Moreover, the ratio of floating rate debt has a mean of 52.99% in the year 1999 and increases to 58.15% in year 2001; this then decreases in year 2002 and stabilises in the years 2003 and 2004. Moreover, Table 10 also gives the overall average of fixed rate debt ratio amounting to 39.05%; floating rate debt ratio 55.13%; and non interest bearing liabilities of 5.81%.

Table 10: Descriptive statistics for percentages of interest rate profile of financial liabilities

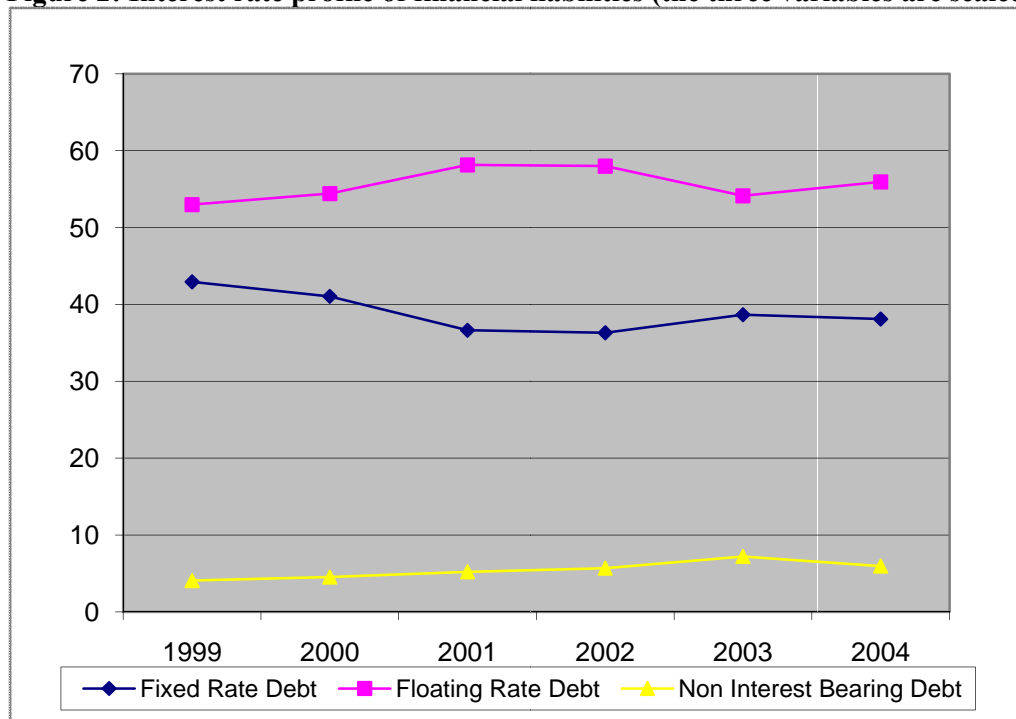
Year	1999	2000	2001	2002	2003	2004	Average
Fixed Rate Debt (Mean)	42.94	41.05	36.64	36.31	38.66	38.1	39.06
Floating Rate Debt (Mean)	52.99	54.42	58.15	58	54.13	55.94	55.13
Non Interest Bearing Debt (Mean)	4.07	4.53	5.21	5.69	7.21	5.96	5.81
Total	100	100	100	100	100	100	100

Source: Author

Figure 2 (below) shows the interest rate profile of the mean, the fixed rate debt to total debt, floating rate debt ratio and the non interest bearing liabilities ratio. The mean of the floating rate debt ratio which is the dependent variable in chapter 6 is higher than the fixed rate debt ratio for the period 1999-2004. At the same time as the mean of the floating rate debt ratio peaked in year 2001, the mean of the fixed rate debt ratio reached its lowest point. This

means that firms value the percentage of the fixed and floating rate debt when considering the debt structure. Finally, the mean of the non interest bearing liabilities is less than 8% of the debt, which means it is not as significant as the fixed rate and floating rate debt.

Figure 2: Interest rate profile of financial liabilities (the three variables are scaled to total debt)



Source: Author

4.3.3: Fixed rate debt by currency

The firms in Table 11 try to match the interest rate profile of their debt across currencies. Table 11 provides details of the proportion of fixed rate debt by currency for the years 1999-2004. It shows the main currencies that firms use: sterling, US Dollar, Euro, Yen and Australian Dollar. An examination of the main currencies shows that there are variations over

the period in this sample. The mean percentage of debt that is fixed for sterling is quite stable, with the exception of year 2000 which has an average of fixed rate debt of 38.32%, high compared to the average sample of firms (32.33). The mean of fixed rate debt for the US\$ has an increasing trend with the sample mean of 24.30%, whilst those of the Euro, Yen and Australian dollar are 13.80%, 5.59% and 4.21% respectively, and lower than the two main currencies (sterling(£) and US(\$)).

Table 11: Fixed rate debt ratio by Currency

	Sterling	USD	Euro	Yen	Aus \$
Liabilities 1999	31.77	23.33	10.60	6.91	4.75
Liabilities 2000	38.32	22.76	11.98	5.71	4.69
Liabilities 2001	33.39	24.74	14.30	4.89	5.55
Liabilities 2002	31.94	25.56	14.02	3.98	5.88
Liabilities 2003	34.42	25.74	12.69	3.56	4.30
Liabilities 2004	33.15	26.44	11.42	3.19	4.44
Sample Average	32.33	24.30	13.80	5.59	4.21

Source: Author

4.3.6: Industry analysis of fixed rate debt.

The previous sections (4.3.1- 4.3.5) provide an overview of fixed rate debt at firms level. This section looks at the fixed rate debt across industries. Many studies in the capital structure literature document industry variations in leverage levels (Venkatesan, 1983; Harris and Raviv, 1991; Maksimovic and Zechner, 1991; Shleifer and Vishny, 1992; and Mohanty, 2003). We examine whether this is the case for fixed and floating debt mix. We tabulate firms in eleven industry sectors using Datastream industry denomination.

In this section, Table 12 provides a trend of fixed rate debt across different industries. Non-financial firms in Datastream are classified as subsidiary industries. These subsidiaries are then grouped into one main industry. For example, similar clusters such as oil and gas exploration and production, and oil services, are grouped under the headings of oil, mining, chemical and other commodities industry. Each subsidiary is then classified and grouped into their respective category. We therefore show how the fixed rate debt for different industries is distributed. Table 13 shows the summary of mean proportions of fixed rate debt for firms by industry for the years 1999-2004. There are eleven industries from the grouping of subsidiary industries (Real Estate Development, Water and Electricity, Telecom Fixed Line, Transport, Shipping and Freight, Retail, Soft Goods, Foods and Drugs, Media and Leisure Facilities, Medical Facilities and Pharmaceutical, Oil Mining and Chemical Commodities, General Engineering, Business Support and Software and Computer Services)¹². These industries are used as dummy variables to control for industry effects in the forthcoming chapters. Table 12 demonstrates the eleven industries and the proportion of fixed rate debt. Real Estate Development, Water and Electricity and Telecom Fixed Line industries are among the industries which have the highest level of fixed rate debt. Similar to the results by Clark and Judge (2003), Real Estate Development and Water and Electricity have high average proportions of fixed rate debt, much higher than the sample average.

¹² The eleven industries are transformed into dummy variables in the next three chapters to control the industry effects.

Table 12 Proportion of Fixed Rate Debt by Industry

INDUSTRIES	1999	2000	2001	2002	2003	2004
REAL ESTATE DEV.	71.48	64.48	63.53	62.87	50.24	64.2
WATER+ELECTRICITY	64.7	59.34	64.85	65.95	49.83	57.65
TELECOM FIXED LINE	61.57	68.56	52.44	54.16	42.39	33.67
TRANSPORT, SHIPPING, FREIGHT	52.97	45.32	43.19	45.66	40.32	43.28
RETAIL,SOFT GOODS,FOODS AND DRUGS	50.62	44.62	39.4	42.75	37.66	38.69
MEDIA AND LEISURE FACILITIES	47.52	45.36	27.28	32.4	40.38	33.85
MEDICAL SUPPLIES AND PHARMACEUTICALS	46.44	44.58	46.51	39.34	34.47	28.82
OIL,MINING,CHEMICAL AND OTHER COMMODITIES	39.26	35.23	34.95	33.15	47.76	29.61
ENGINEERING, GENERAL	34.36	39.35	33.95	37.47	38.54	42.29
BUSINESS SUPPORT	32.96	24.9	29.38	26.8	34.8	40.83
SOFTWARE AND COMPUTER SERVICES	31.86	29.75	26.27	21.75	35.73	18.44

Source: Author

4.4: Conclusion

This chapter began by describing the data and sample of firms employed in this study providing an overview of the variations in the number of observations in the sample over the period 1999 to 2004 using a novel sample of non-financial firms in the UK. The chapter then identified the source of data needed for this study on fixed and floating debt, how the data were collected and the type of data collected. The data on the fixed and floating debt mix were extracted from annual reports. Annual report disclosures were examined meticulously to extrapolate information on risk management practices, mainly on the fixed and floating debt mix.

The second part of this chapter explains how the variables in this study are defined and measured. The main variable, the floating debt ratio, is simply the floating debt scaled to total debt. Apart from the availability of data from annual reports which are mainly used for the collection of variables, other sources such as websites and databases (S&P and DataStream) were also used. Other variables enable this study to be the first to assess the effect on the empirical results of the fixed and floating debt mix in the UK.

The third section presents a detailed analysis of the fixed and floating debt activities for the sample of firms selected. The range and quality of data collected enabled this study to examine features of the data set that have not been previously examined in other studies. In particular, a close examination of the interest rate sample reveals a potentially important characteristic not identified in any previous study. In particular, the analysis of the percentage of fixed and floating debt is described on a yearly basis for the period 1999 to 2004. In this respect, industry characteristics of the fixed rate debt and the weighted average time fixed rate liabilities are described in detail.

The chapter then discussed the foreign currency profile of financial liabilities. It demonstrates that more than 55% of the debts are in sterling followed by the US dollar and Euro respectively. It also describes the financial liabilities by the main currencies and the proportion of fixed debt currencies.

This chapter lays the foundation for the detailed empirical investigation into the determinants of the fixed and floating debt mix for UK non-financial firms, which follows in subsequent chapters where the descriptive analysis and econometric analysis are dealt with in determining the capital structure and floating rate debt ratio and composition of floating rate debt ratio.

Chapter 5: Determinants of Capital Structure and debt structure (Fixed and Floating Debt): new empirical evidence from UK non-financial firms

5.1: Introduction

This chapter analyses the determinants of the capital structure and the composition of the debt structure (fixed debt and floating debt). One of the most common sources of external funds is through the use of debt finance. The corporate debt in the capital structure is characterised by heterogeneity. Debt finance can be classified in terms of short term versus long term debt, secured debt versus unsecured debt, publicly traded debt versus privately traded debt or bank debt and non bank debt. The agency based theoretical research on corporate finance argues that corporate capital structure should include the different types of debt (Diamond, 1993; Park, 2000; Bolton and Freixas, 2000; and DeMarzo and Fishman, 2007). The remaining capital structure studies (Pfaffermay *et al.*, 2008; Ju, 2006; and Miao, 2005) treat debt as homogeneous. In this chapter, the focus is based on the determinants of the capital structure and the heterogeneity of the types of debt in capital structure by employing a new dataset from UK non- financial firms.

The capital structure variation has completely been ignored and treated corporate debt as uniform. One disadvantage of having a uniform corporate debt can be highlighted by the fact that different types of debt have different properties with regard to the profitability and sensitivity of information. The chapter demonstrates how valuable it is to recognise the different types of debt in the capital structure. Focussing on floating debt only may direct firms into a highly risky position. This can lead to variations in cash flow and may result in bankruptcy. However, firms with a good performance, good margin of profits, prefer to take the risk of having floating rate debt. Following Rajan and Zingales (1995), Rauh and Sufi (2008), and Lemmon, Roberts and

Zender (2008), this chapter shows the results of the determinants of capital structure and the variation across the two types of debt employed (fixed debt and floating debt).

The chapter moreover, illustrates how the debt structure varies for firms with good credit quality; that is, firms with credit rating and firms without credit rating. The focus of credit quality is depicted from the theoretical research in which the quality of firms with access to credit is the primary source of variation driving the optimal capital structure (Diamond, 1993; Bolton and Freixas, 2000). Our results show that firms that employ credit rating are large sized firms and are more likely to have fixed rate debt.

As a robustness test, this chapter explains whether yearly changes in debt are affected by changes in the variables in determining the capital structure. It, therefore, breaks down the debt into fixed and floating to discuss whether the changes in the composition of debt have some variations in the changes of the determinants of the capital structure.

The main advantage in answering the question of capital structure is to consider the debt structure (fixed and floating rate debt) by employing a new dataset from UK non-financial firms for the period 1999-2004 which record the types of debt; fixed and floating rate debt, and their relationships with firms having credit rating and non credit rating. These data on corporate debt are collected directly from UK annual reports and are supplemented by data from Standard and Poor's. To our knowledge, this dataset is one of the most comprehensive sources of information with its composition of the outstanding debt types (fixed and floating rate debt) of a sample of public UK non-financial firms.

The structure of this chapter proceeds as follows. The next section reviews the hypotheses of the capital structure, discussed together with the breakdown of the fixed and floating debt mix. Section 5.3 describes the data and the summary statistics. The methodology is explained in section 5.4. Section 5.5 shows the importance of the different types of debt in corporate finance structure. Section 5.6 demonstrates the debt structure across firms with credit rating and without credit rating. Finally, section 5.7 replicates the main finding on the sample of firms with changes in the debt structure. Section 5.8 concludes the chapter.

5.2: Hypotheses

This section provides a review of the four main hypotheses used in previous studies when examining the capital structure. These hypotheses are growth opportunities, firm size, profitability and collaterals and are discussed as follows:

5.2.1: Growth opportunities

The use of debt is quite restricted when firms are close to bankruptcy. Such firms have the value of growth opportunities close to zero. In response to agency theory, Jung *et al.* (1996) show that firms should use equity to finance their growth because such financing reduces agency costs between shareholders and managers, whereas firms with fewer growth prospects use debt because it has a disciplinary role (Jensen, 1986; Stulz, 1990).

Myers (1977) shows firms with growth opportunities may partially invest and for this reason the creditor will be less willing to lend for long horizons. This problem can be solved by short-term financing (Titman and Wessels, 1988) or by convertible bonds (Jensen and Meckling, 1976; Smith and Warner, 1979). According to the pecking order theory, growth firms with strong

financing needs will issue securities less subject to informational asymmetries, that is, short-term debt (floating rate debt). If firms have very close relationships with their banks, there will be fewer informational asymmetry problems, and they will additionally have access to long term debt (most of the time fixed rate debt) financing.

A common proxy for growth opportunities is the market value to book value of total assets. Firms with growth opportunities should exhibit a greater market-to-book value than firms with fewer growth opportunities, but Harris and Raviv (1991) suggest that this is not necessarily the case. This will typically occur when assets whose values have increased over time have been fully depreciated, as well as when assets with high value are not accounted for in the balance sheet.

Rajan and Zingales (1995) find a negative relationship between growth opportunities and leverage. They suggest that this may be due to firms issuing equity when stock prices are high. As mentioned by Hovakimian *et al.* (2001), large stock price increases are usually associated with improved growth opportunities, leading to a lower debt ratio.

Thus, when firms have are close to bankruptcy and with high leverage, the hypothesis for growth opportunities is that firms with higher growth opportunities are less likely to have floating rate debt. This is due to the fact that firms would be in a risky position to have floating rate debt when interest rate fluctuates in a condition of high leverage.

5.2.2: Firm Size

Large sized firms are well diversified and, as a consequence, have less volatile cash flows. Diversified firms are normally large firms that are less risky and are less likely to face financial distress than small firms. This leads to an inverse relationship between firm size and the probability of bankruptcy (Titman and Wessels 1988; Rajan and Zingales, 1995). Large firms prefer to access the capital market and can borrow at favourable conditions (Ferri and Jones, 1979). Grinblatt and Titman (1998) suggest that, although the conflicts between creditors and shareholders are more severe for small firms, firms have the possibility of switching from one investment project to another as small firms tend to have large shareholders. However, this problem may be mitigated by the use of short term debt, convertible bonds, as well as long term bank financing. Most empirical studies indeed report a positive sign for the relationship between size and leverage (Rajan and Zingales, 1995; Frank and Goyal, 2002; Booth *et al.*, 2001). Thus, the hypothesis for this chapter for capital structure is that larger firms have more debt (due to diversification and access to both banks and capital market). However, less conclusive results are reported by other authors (Kremp *et al.*, 1999; Ozkan, 2001). For Germany, however, Rajan and Zingales (1995) find that a negative relationship exists. Kremp *et al.* (1999) confirm the finding of Rajan and Zingales (1995) for Germany.

5.2.3: Profitability

Leverage and profitability has been one of the main theoretical controversies of the capital structure. From a pecking order theory perspective, firms prefer to use internal sources of financing first, then debt, and finally external equity obtained by stock issues. All things being equal, the more profitable the firms are, the more internal financing they will have, and therefore we should expect a negative relationship between leverage and profitability. This relationship is one of the most systematic findings in the empirical literature (Harris and Raviv, 1991; Rajan

and Zingales, 1995; and Booth *et al.*, 2001). Therefore, in this particular aspect, the hypothesis is that firms with higher profitability are less likely to have leverage.

An opposite result is expected in the trade off theory. Profitable firms prefer debt in order to benefit from tax shields. Therefore, profitable firms can borrow more as they are in a better position of paying back their principle in due time. Thus, firms can use profitability as a proxy to forecast the future good performance of the firm.

5.2.4: Collaterals

A firm's borrowing decisions are impacted by the amount of tangible assets and are less subject to informational asymmetries. Fixed assets constitute favourable collateral for debt as, in the case of default, firms can sell their fixed assets. As such, tangible assets represent a positive signal to the creditors. While creditors do not have guarantee on their debts, Scott (1977) suggested that a firm can increase the value of equity by issuing collateralized debt. Hence, firms have an incentive to do so, and the hypothesis is that there is a positive relationship between tangible assets and the degree of leverage.

According to the agency problems between managers and shareholders, Harris and Raviv (1990) suggested that firms with more tangible assets should take more debt. This is due to the behaviour of managers who refuse to liquidate the firm even when the liquidation value is higher than the value of the firm. Therefore, by increasing the leverage, the probability of default will increase, which is to the benefit of the shareholders. In an agency theory framework, debt can have another disciplinary role: by increasing the debt level, the free cash flow will decrease (Grossman and Hart, 1982; Jensen, 1986; Stulz, 1990). As opposed to the former, this

disciplinary role of debt occurs for firms with few tangible assets because, in such a case, it is very difficult to monitor the excessive expenses of managers. According to the pecking order theory, firms with few tangible assets are more sensitive to informational asymmetries. Firms, then, issue debt rather than equity when they need external financing (Harris and Raviv, 1991), leading to an expected negative relation between the importance of intangible assets and leverage.

Most empirical studies conclude a positive relation between collaterals and the level of debt (Rajan and Zingales, 1995; Kremp *et al.*, 1999; Frank and Goyal, 2002). Inconclusive results are reported, for instance, by Titman and Wessels (1988).

5.3: Data

The dataset includes non-financial firms listed on the UK stock exchange for the period 1999-2004. The decision to restrict the sample from the year 1999 is due the disclosure of the FRS 13, which was enforced in that particular year. The FRS 13 requires firms to disclose their debt into fixed and floating rate debt. This chapter also uses credit rating, which is based on the theoretical research on which credit quality is the main determinant of corporate capital structure. The empirical analysis uses credit rating as a measure of a firm's credit quality. Credit rating may respond slowly to new information but it is clearly a focal point in financial markets when it comes to lending to firms (Hand, Holthausen, and Leftwich, 1992; Kisgen, 2006). While rated firms are certainly not identical to unrated firms (Faulkender and Petersen, 2006), rated firms make up a large proportion of fixed rate debt (Chava and Purnannandan, 2007).

The final sample consists of 2458 non-financial firm-year observations for the period 1999-2004. We construct the database by firstly using balance sheet issue level data, which is constructed by an examination of debt in the financial footnotes contained in the annual reports of firms listed

on the London Stock Exchange Market. The data of the types of debt are available following the FRS 13 which requires firms to disclose their financial debt instruments. As a result, firms disclose both fixed debt and floating debt. This study, additionally uses data sourced from Datastream to complement hand collected data from the footnotes of annual reports. In addition to the sample described above, we also collect data for the same sample of firms for credit rating from Standard and Poor's.

Table 13: Summary statistics.

Variables used	Sources	Datastream codes and Formulas	Number of Observations	Mean	Minimum	Maximum
Asset tangibility	Datastream	Total Assets (WC02999) - Current Assets (WC02201) / Total Assets (WC02999)	2319	57.33%	0	100
Market to book value	Datastream	MTBV	2262	13.60	-17.180	234
Return on equity	Datastream	WC08301	2280	5.01%	-28.35%	40.22
Log of total sales	Datastream	Log(WC01001)	2458	12.93	3.09	18.9
Book value of leverage	Datastream	Total Debt (wc03255) / (Market Value of Equity (MV) + Total Debt (wc03255))	2427	24.42	0	100
Fixed debt to total capital	Annual Reports	Fixed rate debt / (Market Value of Equity (MV) + Total Debt)	2183	10.35	0	100
Floating debt to total capital	Annual Reports	Floating rate debt / (Market Value of Equity (MV) + Total Debt)	1803	14.06	0	100
Credit rating	Standard and Poors	See note13	2458	0.23	0	1

Source: Author

Table 13 presents summary statistics for the 2,458 firm-year observations in the sample of UK non-financial firms for the period 1999 to 2004. The first column of the summary statistics table presents the variables utilized in this chapter, followed by the sources, Datastream codes and formulas, mean, minimum and maximum value. Total debt to total capital has a mean of 24.42%, of which fixed debt to

¹³ Credit ratings are sourced, obtained from Standard and Poors'. The dummy variable for firms having a credit rating are denoted as "1" and firms that do not have a rating are treated "0"

total capital is on average 10.35%, and floating debt to total capital is 14%. It can be noted that the total debt to total capital, fixed rate debt to total capital and floating rate debt to total capital all have a minimum of zero debt and a maximum of 100%. Amongst the sample of 2458 firm-year observations, on average 23% of this sample have credit rating. Table 13 also shows that the mean of the return on equity, market to book value and asset tangibility are 5.01%, 13.60 and 57.33% respectively.

Table 14 illustrates the number of observations having different types of debt outstanding. It shows that 281 firms consider their debt as floating debt only and this is 12.80% of the overall debt outstanding. Table 14 also demonstrates that firms with fixed debt only have 6.51% of the total sample of firm year total debt in this study. The results depict that the majority of firms have a mix of fixed and floating debt. The percentage of the overall mixed types of debt amounts to 80.89%.

Table 14: Share of observations with significant amounts of debt types outstanding

	Floating debt (100%)	Mixed	Fixed debt (100%)
Number	281	1772	143
Mean	100	53.75	100
Percentage	12.80	80.69	6.51

Source: Author

5.4: Methodology

5.4.1: Model specification

This chapter employs both panel data and pooled regression methods to estimate the following model:

$$Y_{it} = \alpha_0 + \sum_{j=1}^k \beta_j X_{j,it} + \mu_i + e_{it} \quad \text{-Equation 7}$$

Where, i stand for the i^{th} cross-sectional unit and t for the t^{th} time period. μ_i stands for the firm specific errors and e_{it} is the general error term

The dependent variable (Y_{it}) is the debt to total capital. The explanatory variables denoted by X_j are as follows:

-
- Firm size
 - Asset tangibility
 - Market to book value
 - Profitability
 - $\mu_i + e_{it} = \text{composite error term}$

The composite error term consists of two components u_i and e_{it} (an individual random disturbance which adds to α_o when this effect is considered as fixed plus the white noise term)

5.4.2: Model selection

This section demonstrates the procedures undertaken to reach the final model. We proceed to the econometric estimation in 2 steps: (1) we run the OLS regressions (specifically, we called it pooled OLS: one intercept and one slope); (2) we briefly discuss the convenience of a fixed effect model versus a random effect specification, as well as conducting a battery of tests intended to help discern which regression is more appropriate. Finally, this chapter shows the econometric results obtained in the best level equation in the next section.

5.4.2.1: Testing for the random effects.

We run the ordinary least squares (OLS) regression. However, OLS do not control for unobserved individual heterogeneity. If such unobservable effects are omitted, OLS estimates would be biased. As a result, the panel data is used to eliminate the effects of omitted variables that are specific to individual cross-sectional units and specific time periods (Hsiao, 1999). We proceed to test whether there are any unobserved effects.

We test the null hypothesis that the cross-sectional variance components are zero, and time series variance components are zero, by using the Lagrange Multiplier test. Breusch and Pagan (1980) developed the Lagrange Multiplier (LM) test (Green, 2003, and Judge *et al.*, 1988). If

the null hypothesis is not rejected, the OLS¹⁴ regression model is appropriate. However, if the null hypothesis is rejected, the random effect model is more appropriate. The random effect estimation method treats constant terms as a random variable. In random effect models, firm specific effects are captured as random variables, which are independent of the other regressors. However, this method considers the different firm specific terms as random elements and they are treated as a part of the error term. Therefore, in a random effects model, the error term has two components: the traditional error unique to each observation, and an error term representing the extent to which the intercept of the individual firm differs from the overall intercept.

5.4.2.2: Test for existence of random effects.

If the results of the foregoing test tell us that we should not discard the random effect model, this does not conclude that the fixed effect model should be ruled out. The fixed effect estimation is similar to the random effect estimation, as it consists of any unobservable individual effect.

The Hausman specification test compares the fixed versus random effects under the null hypothesis that the individual effects are uncorrelated with other regressors in the model (Hausman, 1978). If there is no such correlation, then the random effects model may be more powerful and parsimonious. If there is such a correlation (Ho is rejected), the random effects model produces biased estimators, violating one of the GAUSS-Markov¹⁵ assumptions; so a time fixed effect model is preferred.

¹⁴ Note that the LSDV are also tested in this section

¹⁵ Traditional Gauss-Markov assumptions

- $E(e_{it}) = E(u_i) = 0$
- $E(e_{it}^2) = \delta_e^2$
- $E(U_i^2) = \delta_U^2$
- $E(e_{it} U_j) = 0$ for all i, t and j .

5.5: Determinants of capital structure.

Research focussing on total debt does not really take into consideration the different types of debt (fixed and floating debt) which are fractions of variation in capital structure (Titman and Wessels, 1988; Barclay and Smith, 1995; Stohs and Mauer, 1996; and Guedes and Opler, 1996). Table 15 provides the regression results. Several tests are performed prior to the final results in Table 15. The OLS regressions are run and, to test whether there is any omitted variable, the Lagrange Multiplier is applied. The results show that the value of the chi square tests is large, thus statistically significant. Therefore, the results of the Breusch Pagan Lagrange Multiplier in Table 15 confirm that the null hypothesis (no omitted variables) is rejected in favour of the random effect model. Besides this, we use the Hausman specification test to compare the fixed versus random effects under the null hypothesis that individual effects are uncorrelated with other regressors in the model (Hausman, 1978). Table 15 also shows the results of the Hausman test. The null hypothesis is not rejected as the p-value is greater than five percent, suggesting that the random effect is more appropriate for floating debt and fixed debt, whereas for total debt the null hypothesis is rejected as the p-value is less than five percent and the time fixed effect model is more appropriate for both panel A and panel B.

Table 15 shows that the distinction in the types of debt is important in determining what factors are influential in the capital structure decisions. Column 1 of Panel A presents regression coefficients relating the total debt to total capitalisation ratio and the basic determinants of capital structure used by Lemmon, Roberts and Zender (2008) and Rajan and Zingales (1995). The results, of column 1, are consistent with Lemmon, Roberts and Zender (2008), and Rajan and Zingales (1995). Firms with a more profitable and high market to book value utilise less debt. Profitable firms prefer less debt to a certain level that they can manage their own funds

-
- $E(e_{it} e_{js}) = 0$ if $t \neq s$ or $i \neq j$
 - $E(u_i u_j) = 0$ if $i \neq j$

first then will consider debt, while firms with higher asset tangibility and which are large in terms of size utilise more debt as they can diversify their risk and access to different sources of capital whether through financial intermediaries or through the capital markets. When floating debt and fixed debt are considered individually, the results show that there is heterogeneity when the two types of debt are separated. For example, the strong negative correlation between profitability and leverage ratios in the panel data is largely driven by fixed debt. In contrast, profitability is positively correlated with the amount of floating debt to total capital which demonstrates that firms prefer profit first then, choose bank debt which is at a floating rate debt. Similarly, there is a positive coefficient of asset tangibility which is driven by floating debt and fixed debt. It demonstrate that whether firms have fixed debt or floating rate debt asset tangibility can act as a security to cover their debt. Compared with the total debt in the capital structure in column 1, firm size, as measured by logarithm of total sales, is negatively related to the floating debt. This suggests that firms which are large in size are less likely to have floating rate debt as they prefer to tap their debt on the capital market. Moreover, growth opportunities, as measured by market to book value, has a negative sign and both variables are statistically significant at 5% for panel A.

Panel B of Table 15 presents the estimates of the analysis by including both year and industry effects. The results of panel B are similar to panel A. The results of column 1 in Panel B show that profitability and market to book value are positively and statistically significant to total debt to total capital suggesting that growth firms and profitable firms prefer less debt when determining their capital structure. Asset tangibility and firm size are positively related to the dependent variable in column A of Panel B. It informs the author that firms having high amount of fixed assets and firms that are large in size are more likely to have access to funds from either financial institutions or capital markets or both. Moreover, the results of column B

demonstrate that market to book value and firm size are similar to Panel A column B with negative coefficients for both variables. Compared with column 2 of panel A, column 2 of panel B, the result shows that profitability appears to be positively related to floating debt to total capital which demonstrates that firms prefer profitability first then will choose debt to fund their activities. This shows that there is substantial variation across different types of debt in terms of the response to the usually hypothesized determinants of capital structure.

The findings shown in Table 15 inform the researcher that even the basic correlations shown in previous studies between leverage ratios and firm characteristics mask important variation across the types of debt (in this particular case floating debt). This reflects the fact that different types of debt are primarily different in terms of cash flow claims, sensitivity to information problems, and managerial incentive effects. Thus, the results highlight the importance of recognizing debt heterogeneity in capital structure studies.

Table 15 : Determinants of capital structure: panel data estimation (random effect model)

*The dependent variables in both Panel A and Panel B are total debt, floating debt and fixed debt are all scaled to total capital. White heteroscedastic consistent errors, corrected for correlation across observations of a given firm, are reported in parentheses [Rogers (1993) and White (1980)]. All models in panel A include year dummy variables and panel B includes both year and industry dummy variables. The sample is based on listed non-financial firms for the period between 1999 and 2004. *** indicates statistical significance at 1% level; ** indicates statistical significance at 5% level; * indicates statistical significance at 10% level.*

	Panel A			Panel B		
	Total Debt	Floating Debt	Fixed Debt	Total Debt	Floating Debt	Fixed Debt
Profitability	-0.0085*** (0.0016)	0.001741 (0.00114)	0.0006 (0.0007)	-0.0085*** (0.0015)	0.0017* (0.00101)	0.0006 (0.00265)
Asset tangibility	0.2825*** (0.0206)	0.0579** (0.0257)	0.1551*** (0.0182)	0.2046*** (0.0233)	0.0451 (0.0322)	0.0944*** (0.0206)
Market to book value	-0.0001** (0.00006)	-0.0002** (0.0001)	-0.0001** (0.00004)	-0.0001** (0.00006)	-0.00018** (0.0001)	-0.0001* (0.00003)
Firm size	0.0244*** (0.0035)	-0.01611*** (0.0041)	-0.0035 (0.0028)	0.0252*** (0.004)	-0.0165*** (0.0043)	-0.0039 (0.0027)
Year dummy	Yes	Yes	Yes	Yes	Yes	Yes
Industry dummy				Yes	Yes	Yes
No. of observations	2085	1577	1868	2085	1577	1868
R ²	0.20	0.03	0.02	0.20	0.03	0.02
Hausman test	0.000***	0.185	0.189	0.007***	0.183	0.178
Lagrange Multiplier	1346.24***	123.54***	64.54***	1249.36***	113.23***	75.19***

Source: Author

5.6: Debt heterogeneity (fixed and floating debt), capital structure and credit rating

The results in the section 5.5 suggest that an explicit recognition of different types of debt is necessary to understand the composition of debt in the capital structure. In this section, we motivate our empirical analysis of the relation between fixed and floating debt, credit rating, by examining the hypothesis from the theoretical literature on debt composition.

According to the seminal article of Diamond (1991), firms move from bank debt to non bank debt as credit quality improves. Chemmamur and Fulghieri (1994), Boot and Thakor (1997), and Bolton and Freixas (2000) acknowledge this hypothesis. In Diamond's (1991) model, firms graduate from bank debt to capital market by establishing a good reputation; that is, firms keep earnings high and repay their debt. The main variable generated before considering whether a firm is a bad firm or a good firm, even with good performance, is credit rating. Bad firms normally have a lower history of earnings or a higher probability of selecting bad projects in the future. High quality firms, with credit rating, borrow directly from the capital market to avoid any additional costs of bank debt.

Capital market debt, bank debt and equity were explored by Bolton and Freixas (2000). The distinction between bank debt and capital market debt (bonds) is the ability of banks to monitor firms. Bondholders liquidate the borrower, whereas, when profitability is low and the firm's performance is not good enough to pay back creditors, banks have the ability to investigate the borrower's future profitability. The findings of Bolton and Freixas (2000) are that firms of high quality do not value the ability of a bank to investigate and they therefore rely on capital market. In

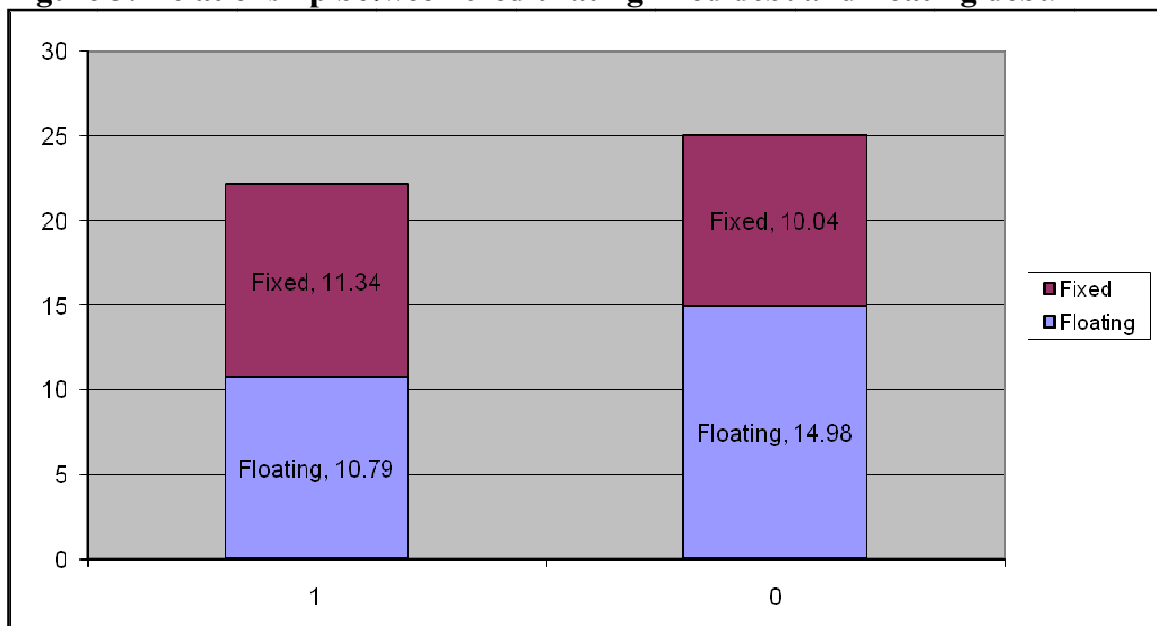
this study, high quality firms are firms having a credit rating, whereas firms without credit rating are firms which are considered to rely mainly on bank debt.

The main hypothesis that emerges from this kind of model is that firms having access to capital market have less monitoring duty (bank debt) and are large sized firms. These types of firm tend to have more equity and less debt.

5.6.1: Fixed and floating rate debt, capital structure and credit rating

There is a clear identification in the section 5.5 that debt heterogeneity is important in determining the capital structure. In this section, we motivate our empirical analysis of the relation between debt structure and credit rating by examining hypotheses from the theoretical literature on debt composition.

Figure 3: Relationship between credit rating fixed debt and floating debt.



Source: Author

Figure 3 illustrates the first result for firms in the UK on the relation between the types of debt with credit rated and non credit rated firms. The two types of debt are fixed rate debt and floating rate

debt. On the horizontal axis, “1” denotes firms with credit rating and “0” denotes firms without credit rating. As illustrated from Table 13, the mean of firms having credit rating is only 23% suggesting that the majority of firms do not have credit rating but have access to mainly financial intermediaries. Therefore, it indicates the high amount of debt for firms without credit rating. Figure 3 demonstrates that firms with credit rating have fewer floating debts to total capitalisation rather than fixed debt to total capitalisation. The first result also shows that firms with credit rating have more total debt than firms without credit rating. The second point to note in Figure 3 is that firms with credit rating have more fixed debt than floating debt. This suggests that firms with credit rating have access to capital market and other foreign debt market. On the right hand side of the diagram, firms without credit rating have more floating debt than fixed rate debt compared to firms with credit rating. We can summarise that firms without credit rating are firms which do not want to be considered as rated firms or does not have a good credit quality have no other choice than financial intermediaries such as banks. Thus, these firms do not access to capital market and face information asymmetry are more likely to have floating rate debt since most of their debts are borrowed from banks.

5.6.2: Analysis of credit rating and fixed and floating debt mix.

Tables 16 and 17 provide the regression results of firms with credit rating and firms without credit rating. Equation 7 is applied for the regression analysis in both Tables 16 and 17 The OLS regressions are run and the Lagrange Multiplier test is used to check whether there are any omitted variables. The results show that the value of the chi square tests is large, thus statistically significant. Therefore, the results of the Breusch Pagan Lagrange multiplier in Tables 16 and 17 confirm that the null hypothesis (no omitted variables) is rejected in favour of the random effect model. Moreover, the Hausman specification test is used to compare the fixed versus random effects under the null

hypothesis that individual effects are uncorrelated with other regressors in the model (Hausman, 1978). Tables 16 and 17 also show the results of the Hausman test. The null hypothesis is not rejected, suggesting that the random effect is more appropriate for floating debt and fixed debt; whereas for total debt, the null hypothesis is rejected and the fixed effect model is more appropriate for both Panel A and Panel B for Tables 16 and 17.

5.6.2.1: Analysis of credit rating and fixed and floating debt mix (rated firms only).

Table 17 illustrates the results in section 5.6.1 in a regression context. It shows firms with credit rating only. It illustrates the results of the capital structure with respect to the independent variables. Panel A of Table 16 shows the results of the regression with year effect only and Panel B illustrates the analysis of the capital structure with both year and industry effects. Both Panel A and Panel B have dependent variables, total debt, floating debt and fixed debt, which are all scaled to total capital. When total debt is regressed against the independent variables in Panel A, profitability, asset tangibility and firm size are statistically significant. Profitability and firm size are negatively related to total debt, whereas asset tangibility is positively related to capital structure. Column 2 of Panel A shows that asset tangibility and firm size are statistically significant. Similar results are found for fixed debt and Panel B. The analysis in Table 16 shows that firm size appears to be statistically significant in all regressions. This shows that large firms are more likely to have credit rating. Hence, firm size and asset tangibility are important elements when considering the capital structure decision, as well as the fixed and floating debt.

Table 16: Determinants of capital structure: panel data estimation (random effect model) rated firms

The dependent variables in both Panel A and Panel B are total debt, floating debt and fixed debt are all scaled to total capital. White heteroscedastic consistent errors, corrected for correlation across observations of a given firm, are reported in parentheses [Rogers (1993) and White (1980)]. All models in panel A include year dummy variables and panel B includes both year and industry dummy variables. The sample is based on listed non-financial firms for the period between 1999 and 2004. *** indicates statistical significance at 1% level; ** indicates statistical significance at 5% level; * indicates statistical significance at 10% level.

	Panel A			Panel B		
	Total Debt	Floating rate	Fixed rate	Total Debt	Floating rate	Fixed rate
Profitability	-0.0048*** (0.0009)	0.0012 (0.0028)	0.0006 (0.0006)	-0.0077*** (0.0016)	0.0006 (0.00259)	0.0009 (0.00201)
Asset Tangibility	0.3724*** (0.0481)	0.0678* (0.0412)	0.1692*** (0.0459)	0.3168*** (0.0538)	0.1114** (0.0549)	0.1155** (0.053)
Market to book value	-0.0007 (0.0006)	-0.0524 (0.0406)	0.0002** (0.0003)	-0.0007 (0.0006)	0.00044 (0.0004)	0.0003 (0.0004)
Firm Size	-0.0718*** (0.0111)	-0.0279*** (0.0088)	-0.0203** (0.00809)	0.0724*** (0.0122)	-0.0298*** (0.0117)	-0.0143 (0.0093)
Year Dummy	Yes	Yes	Yes	Yes	Yes	Yes
Industry Dummy				Yes	Yes	Yes
No. of observations	475	365	430	475	365	437
R ²	0.35	0.12	0.11	0.36	0.14	0.11
Hausman Test	0.000***	0.1742	0.64	0.000***	0.115	0.6862
Lagrange Multiplier	453.10***	40.06***	65.95***	413.92***	42.06***	37.38***

Source: Author

5.6.2.2: Analysis of credit rating and fixed and floating debt mix (unrated firms only).

Table 18 illustrates the results in a regression context where firms without credit rating are considered. In both Panel A and Panel B, the left hand side variables (dependent variables) are individual types of debt scaled by total capitalisation. The first dependent variable is total debt, and the others are floating debt and fixed debt. Panel A shows the regressions with only year fixed effects where profitability, asset tangibility and firm size are statistically significant. Profitability, as measured by return on equity, and firm size, as measured by logarithm of market capitalisation, are negatively related to the capital structure, while asset tangibility is positively related to capital structure. The results of column B and column C show that asset tangibility and market to book value are statistically significant. Similar to the result of total debt, asset tangibility is positively related to both floating and fixed debt. Market to book value is negatively related to both fixed and

floating debt which is inconsistent with the results of total debt. This result shows that both fixed debt and floating debt have some variation compared to the uniform debt utilized by the capital structure.

Panel B shows regression with both year and industry effects. The results of total debt are similar to Panel A, with a slightly lower coefficient for profitability and asset tangibility. However, the result for market to book value is slightly higher compared to Panel A. When floating debt to total capital is considered, profitability, market to book value and firm size are statistically significant. Asset tangibility and market to book value have the expected sign and are statistically significant. The positive result of profitability shows that firms are more likely to have bank debt when considering floating debt in the capital structure.

The resulting analysis in Table 17 informs the researcher that firms which are not accessing capital market (without credit rating) have asset tangibility as the main collateral to access funds from banks.

Table 17: Determinants of capital structure: panel data estimation (random effect model) unrated firms

The dependent variables in both Panel A and Panel B are total debt, floating debt and fixed debt are all scaled to total capital. White heteroscedastic consistent errors, corrected for correlation across observations of a given firm, are reported in parentheses [Rogers (1993) and White (1980)]. All models in Panel A include year dummy variables and Panel B includes both year and industry dummy variables. The sample is based on listed non-financial firms for the period between 1999 and 2004. *** indicates statistical significance at 1% level; ** indicates statistical significance at 5% level; * indicates statistical significance at 10% level.

	Panel A			Panel B		
	Total Debt	Floating rate	Fixed rate	Total Debt	Floating rate	Fixed rate
Profitability	-0.0095*** (0.0023)	0.00146 (0.0009)	-0.0006 (0.0006)	-0.0091*** (0.0026)	0.0016* (0.0009)	-0.0003 (0.0006)
Asset Tangibility	0.3473*** (0.0219)	0.0542* (0.0285)	0.1545*** (0.0196)	0.2816*** (0.0242)	0.0297 (0.0366)	0.0969*** (0.0232)
Market to book value	-0.0001 (0.00007)	-0.00022** (0.0001)	-0.0001** (0.00005)	-0.00004 (0.00008)	-0.00019** (0.0001)	-0.0001* (0.00004)
Firm Size	-0.0431*** (0.0047)	-0.0085 (0.0064)	-0.0038 (0.0043)	-0.0452*** (0.0046)	-0.0112* (0.0066)	-0.001817 (0.0041)
Year Dummy	Yes	Yes	Yes	Yes	Yes	Yes
Industry Dummy				Yes	Yes	Yes
No. of observations	1587	1212	1438	1587	1212	1438
R²	0.29	0.06	0.06	0.29	0.06	0.07
Hausman Test	0.000***	0.153	0.659	0.002***	0.142	0.395
Lagrange Multiplier	1200.69***	116.75***	103.90	1034.14***	104.39**	56.53***

Source: Author

5.7: Changes in capital structure and fixed and floating debt

This section tests the effect of changes in the debt policy (capital structure) and how this impacts the decomposition of debt (fixed debt and floating debt). Unlike previous studies that examine levels of variables to explain what may determine debt policy, this section calculates yearly changes in variables to provide stronger tests of relation in the capital structure.

In this section of the analysis, we examine the relationship between changes in dependent and independent variables. The dependent variables are changes in total debt, changes in floating debt and changes in fixed debt in both Panel A and B in Table 18. Change in any variable is dealt with from year to year for any firm. Each firm has a maximum of five observations; thus the change is

from 1999 to 2000, from 2000 to 2001, from 2001 to 2002, from 2002 to 2003 and 2003-2004. The yearly change in dependent variables of the firms is regressed on changes in the independent variables:

where the change (Δ) in the variable X of firm i at year t is defined as:

$$\Delta X_{i,t} = X_{i,t} - X_{i,t-1}$$

for all variables.

The specific variable definitions are as follows:

Δ Total debt to total capital_{i,t} = Δ ratio of total debt divided by total capital of firm i for year t.

Δ Fixed debt total capital_{i,t} = Δ ratio of fixed debt divided by total capital of firm i for year t.

Δ Floating debt ratio_{i,t} = Δ ratio of floating debt divided by total capital of firm i for year t.

Δ Market to book value_{i,t} (Δ MTBV_{i,t}) = Δ market value to Book value of firm i for year t.

Δ ROI_{i,t} = Δ in return on invested capital of firm i for year t.

Δ Asset tangibility_{i,t} = Δ asset tangibility of the firm i for year t

Δ Firm Size_{i,t} = Δ total sales of firm i for year t.

The first three factors of the control variables (market to book value, profitability and asset tangibility) analyzed are control variables, which have been found to be important in previous studies of levels of leverage (Bradley, Jarrell and Kim, 1984; Titman and Wessels, 1988; Bathala, Moon and Rao, 1994; Grier and Zychowicz, 1994). The final traditional variable is the size of the firm, Δ SIZE_{i,t}, (Friend and Lang, 1988; Crutchley and Hansen, 1989; Grier and Zychowicz, 1994). Friend and Lang (1988), among others, argued that the larger the size of the firm, the more debt financing they would be able to use as there is easier access to the credit markets. We predict a

positive relationship between $\Delta DEBT_{i,t}$ and $\Delta SIZE_{i,t}$ since, when a firm increases in size, the cost of debt falls allowing the firm to increase its level of debt.

Ross's (1977) leverage signalling would predict that profitability increases followed by an increase in leverage. This type of relationship signals the high quality of firms. The pecking order hypothesis predicts a negative relationship between leverage and profitability, as more profitable firms will retain more earnings, and therefore will have less of a need of outside debt. We use return on investment, $\Delta RO_{i,t}$, for the firm to measure profitability. A positive relationship between the change in debt level and the change in the return on assets is expected, according to Ross, but a negative relationship is expected by the pecking order theory.

We employ the annual change in the firm's market to book value to represent the firm's investment opportunities. Myers (1984) argues the greater the growth potential of the firm, the lower the firm's debt level because management will preserve borrowing capacity to finance potential growth. Therefore, a negative relationship is expected between change in debt and change in market to book value, according to informational asymmetry. Jensen and Meckling's (1976) model also predicts a negative relationship between debt and growth.

The OLS regressions run the Lagrange Multiplier test to check if there are any missing variables. A statistically significant Breusch Pagan Lagrange Multiplier test confirms that the null hypothesis (no omitted variables) is rejected in favour of the random effect model. Moreover, the Hausman specification test is used to compare the fixed versus random effects under the null hypothesis that individual effects are uncorrelated with other regressors in the model (Hausman, 1978). Table 18 also shows the results of the Hausman test. The null hypothesis is not rejected, suggesting that the

random effect is more appropriate for floating debt and fixed debt; whereas for total debt, the null hypothesis is rejected and the fixed effect model is more appropriate for both Panel A and Panel B for Table 18.

Panel A of Table 18 illustrates the results of the changes in debt, changes in floating debt and changes in fixed debt with year fixed effect only. The three dependent variables are all scaled to total capital. We find that larger firms are less able to handle a larger amount of debt financing. We find a negative relationship between the change in debt and the change in the size ($\Delta SIZE_{i,t}$) of the firm. This is consistent with the finding by Chaplinsky and Niehaus (1993), who find a negative relationship between actual size and level of the debt ratio, but is inconsistent with Grier and Zychowicz (1994). Consistent with traditional theory, studies by Friend and Lang (1988), Titman and Wessels (1988), Bathala, Moon and Rao (1994), and Grier and Zychowicz (1994) have shown levels of debt to be negatively related to profitability. However, Long and Malitz (1985) find no relationship between debt and profitability. Consistent with agency theory and the pecking order hypothesis but inconsistent with Ross's signalling model, we find that as profitability declines, firms increase their amount of debt financing. Many studies find this negative relationship, including Bradley, Jarrell and Kim (1984), Friend and Lang (1988), Jensen, Solberg and Zorn (1992) and Grier and Zychowicz (1994). Managers do not adjust their debt ratio in response to earnings. An explanation for this relationship is that as profits are retained in the firm, the book value of equity rises, so the debt ratio falls. Finally, the results show a positive relationship between changes in asset tangibility and changes in debt. This suggests that an increase in asset tangibility leads to an increase in debt. Similar results can be depicted for Panel B which takes into account both year fixed effect and industry fixed effect.

The second and third columns in Table 18 show the floating and total debt. The results show that asset tangibility is positive and statistically related to both fixed and floating debt. Growth opportunities and firm size are negative and statistically significant with respect to floating debt. This shows that asset tangibility and firm size are consistent with the debt. Similar results are found for Panel B where asset tangibility, market to book value and firm size are statistically significant but with different coefficients, as industry fixed effects are considered. When fixed debt is scaled to total capital in the third column in Panel A, only asset tangibility appears to be consistent with total debt to capital results. The results of fixed debt in Panel B are consistent with Panel A with slightly lower coefficients.

It is important to examine the yearly changes in debt financing as well as the composition of debt financing and the factors which lead to the capital structure choice, unlike other studies that examine the level of the firm debt. The analysis has shown that the results are consistent with agency theory and the pecking order hypothesis, and also that firm size is a key variable when change of debt is considered.

Table 18: Changes of capital structure: panel data estimation

The dependent variables in both Panel A and Panel B are, changes total debt, changes in floating debt and changes in fixed debt are all scaled to total capital. White heteroscedastic consistent errors, corrected for correlation across observations of a given firm, are reported in parentheses [Rogers (1993) and White (1980)]. All models in Panel A include year dummy variables and Panel B includes both year and industry dummy variables. The sample is based on listed non-financial firms for the period between 1999 and 2004. *** indicates statistical significance at 1% level; ** indicates statistical significance at 5% level; * indicates statistical significance at 10% level.

	Panel A			Panel B		
	Δ Total Debt	Δ Floating Debt	Δ Fixed rate	Δ Total Debt	Δ Floating Debt	Δ Fixed rate
Δ Profitability	-0.0065*** (0.0017)	0.0041 (0.0065)	-0.00118 (0.00182)	-0.0066*** (0.0017)	0.0038 (0.0069)	-0.0009 (0.00189)
Δ Asset Tangibility	0.3150*** (0.0265)	0.0489* (0.0287)	0.1424*** (0.02205)	0.2880*** (0.0269)	0.0642** (0.0317)	0.1179*** (0.0229)
Δ Market to book value	-0.0001 (0.0001)	-0.000201** (0.0001)	-0.0001*** (0.00004)	-0.0001 (0.0001)	-0.00018* (0.0001)	-0.0001*** (0.00004)
Δ Firm Size	-0.0356*** (0.0047)	-0.01324*** (0.0045)	-0.0042 (0.0034)	-0.0348*** (0.00464)	-0.015*** (0.01901)	-0.0035 (0.003317)
Year Dummy	Yes	Yes	Yes	Yes	Yes	Yes
Industry Dummy				Yes	Yes	Yes
No. of observations	1482	898	1257	1482	898	1257
R ²	0.13	0.003	0.01	0.14	0.003	0.01
Hausman Test	0.000***	0.19	0.11	0.000***	0.22	0.10
Lagrange Multiplier	859.57***	39.64***	108.56***	822.49***	31.91***	82.98***

Source: Author

5.8: Conclusion

Using a novel dataset on the debt structure of a large sample of public non-financial firms, we show that debt heterogeneity is a first order aspect of firm capital structure. The majority of firms in our sample simultaneously use fixed debt and floating debt, and we show that a unique focus on leverage ratios misses important variations in security issuance decisions. Furthermore, an analysis of the correlations between traditional determinants of capital structure (such as profitability) and different types of debt shows that the different types of debt are heterogeneous. These findings suggest that an understanding of the types of debt is important in the corporate capital structure, and is also appreciative of how and why firms use multiple types of corporate debt. This chapter, then, examines debt structure across the credit quality distribution. It shows that through a separation of a sample of firms with credit rating (high credit quality) and non credit rating (low credit quality), the researcher is helped to analyse the credit quality of the

sample of firms, using debt structure consisting of both fixed debt and floating debt. We substantiate these results in a separately collected dataset for firms that experience fixed and floating debt in Figure 3. This shows that firms with credit rating prefer fixed debt, whereas firms without credit rating have lower quality and are generally in favour of having floating debt. This chapter also shows the result in terms of regression analysis when the data set is split into credit rated firms and non credit rated firms. The result demonstrates that firms with credit rating have firm size and asset tangibility statistically significant to total debt and floating rate debt. Table 18 shows firms without credit rating still have firm size, asset tangibility and profitability as determining factors of capital structure. When considering the types of debt variation across the different types of debt, asset tangibility is statistically significant to fixed debt and floating debt, which is consistent with total debt. However, market to book value is a key factor for fixed and floating debt. The results show that there are differences in the results when firms have credit quality. Large firms with a high amount of asset tangibility, with credit rating, are determining factors for both capital structure and debt structure.

Chapter 6: Determinants of floating rate debt ratio: new empirical evidence from UK non-financial firms

6.1. Introduction

The aim of this chapter is to empirically examine the determinants of floating rate debt ratio of UK non-financial firms from management or CFO's point of view. Given the fact that a firm's financing decision is mainly concentrated towards the capital structure decision (equity versus debt allocation), this study is an extension that mostly addresses the debt structure decision (for example, fixed versus floating rate debt allocation), which is comparatively limited. It is common practice for any firms to issue both fixed and floating rate debt and this decision is dependent on the management perception. When the total debt issuance leans more toward fixed or floating rate exposure, this might signal the company's view on interest rates. Issuing more than 50% of debt as floating rate can be a signal from CFOs' point of view that rates are on the decline (Brobst and Huang, 2002). What determines the floating rate debt ratio will be the central discussion in this chapter.

The main objective of this study is to provide new evidence on the determinants of the floating rate debt ratio in the UK. Prior studies focus on different countries as follows: US firms (Chava and Purnanandam, 2007; Faulkender and Chernenko, 2007; Vickery, 2008; Faulkender, 2005); Swedish firms (Rokkanen, 2007); and UK firms (Antoniou *et al.*, 2009). Although the Antoniou *et al.* (2009) study is the first UK study to concentrate on the fixed and floating rate debt mix, they focus their attention only on new deals and the interest rate exposure by using an event study. Thus, this study is the first of its kind to employ UK data where outstanding debt is employed. It discusses the determinants of floating rate debt of UK non-financial firms which are

examined by using a panel data set of firms over a yearly period from 1999-2004. It presents the findings by taking into consideration the total sample in determining the floating rate debt ratio. Besides this, the chapter attempts answer the research question of whether firms are timing the market or hedging in determining the floating rate debt ratio. Moreover, this chapter presents the robustness tests by firstly separating the sample into two segments. The first segment, considers only non-financial firms which employs interest rate swap usage as a derivative instrument, and the other considers non financial firms which do not rely on derivative instrument. The main reason behind this segmentation is to find out whether internal hedging technique is an important factor when deciding on the floating rate debt ratio when considering firms with interest rate swaps (hedgers) and without interest rate swaps (non-hedgers). The financial manager can then decide which method is important when focusing on the floating rate debt ratio. Firms can reduce the variability of cash flows and, as a result, lower their financial distress costs (Smith and Stulz, 1985). Firms that are employing interest rate swaps as a measure of derivatives are normally unconcerned by the natural hedge. However, firms which are not equipped with interest rate swaps (derivatives) are more likely to employ the ratio of financial assets to financial liabilities (natural hedge) in an attempt to reduce the volatility of cash flows.

The second robustness test within this sample is to find out whether the factors determining the floating rate debt ratio have similar relationship when considering smaller firms.. This chapter tries to find out whether smaller firms in the dataset are more likely to have more floating rate debt. Smaller firms in this study are firms less than the median of the market capitalisation. These firms can be listed as at year 1999 and then dropped from the Financial Times Stock Market after year 1999. Normally smaller firms are constrained to borrow from banks which lend at a floating rate debt. In addition, smaller firms are less likely to have a risk management

department strategy set up to control any risk affecting the organization. As such smaller firms are more likely to rely on natural hedge to manage their floating rate debt ratio. Finally this chapter presents the results of the changes of the determinants of floating rate debt ratio in the last section.

This chapter proceeds as follows. Section 6.2 shows the descriptive statistics of the potential variables employed in this study. Section 6.3 gives a brief explanation of the expectation of each proxy. The specification of the model and model selection are explained in section 6.4. Section 6.5 discusses the findings of the whole sample together, with and without interest rate swap users and smaller firms in the sample. It also presents the results of the changes of the floating rate debt ratio as a robustness test. Finally, the chapter provides some concluding remarks on the results.

6.2: Descriptive Statistics

Table 19: Summary statistics.

Variables used	Sources	Datastream codes and Formulas	Number of Observations	Mean	Minimum	Maximum
Floating Rate Debt Ratio	Annual reports	(Total Floating rate debt/Total debt)*100	2199	56.01	0	100
Ratio of financial assets to financial liabilities	Annual reports	Total Financial assets/Total Financial Liabilities	1782	0.086	0	3.97
Credit rating	Standard and Pooors	See note ¹⁶	2458	0.23	0	1
Capital expenditure to Total Asset	DataStream	WC08416	2269	0.61	0	98.4
Capital Expenditure to Sales	DataStream	WC08421	2260	21.7	0	34.727
Debt to Maturity for less than 1 year	Annual reports	See note ¹⁷	1820	30.4	0	100
Debt to Maturity for more than 5 Year	Annual reports	See Note ¹⁸	1670	24.32	0	100
Interest Rate Swaps	Annual reports	Hand collected	2456	53.1	0	100
Total Sales(M)	DataStream	WC01001	2308	2,242	112,175	1.72E+05
Market Capitalisation(M)	DataStream	WC08001	2271	2,731	164,715	2.14E+05
Leverage	DataStream	Note ¹⁹	2227	26.4	0	87.96
Return on Equity	DataStream	WC08301	2201	5.1	-15.51	17.429

The data for the sample is hand collected from the annual reports of listed firms. The sample comprises only non-financial firms where market capitalisations greater than £1000m are considered. Firms from the financial services industry are excluded from the sample because of their risk management activities which include both hedging and speculative transactions, whereas non-financial firms are assumed to conduct only hedging transactions. The first year (year 1999), 458 non-financial firms are selected and the same firms (458) are collected for the remaining years (2000-2004). However, the number of firms varies from year to year in a

¹⁶ Credit ratings are sourced, obtained from Standard and Pooors', Moodys' or Fitch. The dummy variable for firms having a credit rating are denoted as "1" and firms that do not have a rating are treated "0"

¹⁷ Debt to maturing within 1 year = (Short-term Debt + Current Portion of Long-term Debt due within 1 year) / Total Debt

Where short-term debt = debt due within 1 year

¹⁸ Debt to maturing after 5 years = Debt Maturing after 5 years / Total Debt

¹⁹ Total Debt = Total borrowings repayable within 1 year (WC03040) + Total Loan Capital (WC03251)
 Net Debt = Total Debt (As calculated above) - Total Cash and Equivalents (WC02001)
 Market Value of Assets = Market Value of Equity (MV) + Net Debt (As Calculated Above)
 Assets or Net Assets = Total Assets (WC02999) - Total Cash & Equivalents (WC02001)
 Net Leverage = Net Debt (As calculated Above) / Market Value of Assets (As calculated Above)
 Gross Leverage = Total Debt (As calculated Above) / (Market Value of Equity (MV) + Total Debt (As calculated Above))
 Leverage = Total Debt (As calculated Above) / Assets (As calculated above)

decreasing trend from 458 in 1999 to 385 in year 2004. The main reasons for the decline in the number of firms are mainly due to mergers, takeovers and acquisitions. The final sample consists of a total of 2458 firm-years.

Table 19 provides the descriptive statistics for the firms' characteristics. Using data sourced directly from annual reports, we find that on average 56.01% of firm-years have floating rate debt ratio. In comparison, 57% of US firms have floating rate debt ratio (Chava and Purnanadam, 2007). Employing credit rating data sourced directly from S&P and Fitch, we find on average 23% of firm-years have a credit rating and, thus, access to the public debt market. We should note that credit rating in this study is a dummy variable, denoted as "1" if the firm has a credit rating and "0" otherwise. Capital expenditure to sales, capture growth opportunities, has an average of 21.7%.

In this study, debt to maturity is employed. We measure debt to maturity in two folds. First, the percentage of debt maturing within one year, and the other variable measures the percentage of debt maturing after five years. The mean for the percentage of debt maturing within one year is 30%, while the percentage of debt maturing after five years is 24%. Moreover, the interest rate swap, which is a dummy variable, has an average of 53%, which suggests that more than half the firms may change the decision from fixed to floating rate debt and vice versa at some point during the period 1999-2004.

Total sales and market capitalisation, as described in Chapter 4 (*p.101*), are amongst the several different measures of firm size employed in this study. The mean of total sales amounts to 2,242 million, and market capitalisation is 2,731 million.

Leverage proxy is for the likelihood of firms being in financial distress. Leverage is measured as the ratio of a firm's total debt to total value of assets. The mean for leverage is 26.4%. This is consistent with the results reported by Chava and Purnanandam (2007), who measured financial distress by debt to assets.

6.3: Summary of hypothesis

The review of the literature depicts the determinants of the floating rate debt. Different variables are employed and each determinant has its own expectation and this section summarise the hypotheses of the floating rate debt ratio.

6.3.1: Sources of debt

As mentioned in Chapter 2 (*p. 30*), the two main sources of debt finance are banks and the public debt market. Banks are better at piercing the information asymmetry between the firm and its lenders, or better at monitoring firms than the market; then larger, more informational transparent firms should borrow from the public market, whereas smaller, more opaque firms should borrow from banks (Faulkender, 2005). Cantillo and Wright (2000), and Faulkender and Petersen (2001) support this theory, showing that as sales increase, firms are less likely to borrow from banks. Credit rating is utilized as a proxy for the public debt market. The relationship between credit rating (sources of public debt) and floating rate debt is expected to be

negative since debt sourced from the capital market is more likely to have a fixed rate of interest. The hypothesis is that firms having credit rating are less likely to have floating rate debt as credit rating firms can have access to capital markets or foreign debt.

6.3.2: Debt to maturity

Following Brick and Palmon (1992) on tax arguments, a firm with long term debt (fixed rate debt) becomes more favourable when interest rates are volatile and when the firm expects to have a stream of taxable earnings. As such, firms issue fixed rate debt. This is possible, as any increase in the volatility of interest rates reduces the present value of tax shields on short term debt. Ultimately, rates on overnight debt are adjusted so that they always equal the market value. As such, the hypothesis for debt to maturity greater than five years (long term debt to maturity) has a negative relationship with floating rate debt ratio. However, short term debt to maturity can be hypothesised as having a positive relationship to the floating rate debt ratio as short term debt are more likely to borrow from banks and hence, at a floating rate debt.

6.3.3: Financial distress

Trade-off theory deals with financial distress. The cost of financial distress depends on the likelihood of distress and the cost of bankruptcy. The proportion of debt in the capital structure is a key aspect that can yield financial distress. Firms with more leverage have a higher probability of facing financial distress. This can be due to fluctuations in the interest rate and cash flow. Firms may face financial difficulty when they are unable to pay their debts and, therefore, will accrue more interest rate payments which will add up with their total debt.

One technique to mitigate the fluctuation in interest rates for a firm which has a high degree of financial leverage is to have a fixed rate debt so that any adverse fluctuation in interest rates will not worsen the firm's performance. By maintaining a high percentage of fixed rate debt, firms reduce the volatility of their debt service payments and, consequently, lower the probability of financial distress. The hypothesis is that firms with the higher costs of financial distress will have a lower percentage of floating rate debt. Thus, a negative relation is expected between leverage, the proxy for financial distress and floating rate debt.

6.3.4: Hedging motives.

Fluctuation in interest rates affect the volatility of cash flows by reducing retained earnings. The volatilities of cash flows vary from firm to firm. One way to manage these exposures is through a natural hedge. For example, for firms whose cash flows co-vary positively with interest rates, internal cash flows will partially offset the effects of interest rates and the supply of credit. The hypothesis is that when firms with natural hedge strategy to reduce the risk of fluctuation, floating rate debt is preferred to fixed rate debt. The rationale for a natural hedge is that if net profit before interest and tax moves in the same direction as the interest rate, this suggests that retained profit is not affected; hence, firms can borrow at floating rate and, thus, a positive sign is expected between natural hedge and floating rate debt. The proxy employed in this chapter as a natural hedge is the ratio of financial assets to financial liabilities. Firms with more financial assets will partially match financial liabilities to ensure that there is a natural hedge or internal hedging. Moreover, according to the hedging theories, firms can use interest rate hedging more

particularly interest rate swaps when choosing between fixed and floating rate debt. They can swap from fixed to floating when the interest rate is expected to decrease and vice-versa.

6.3.5: Profitability

According to the pecking order theory, firms prefer internal sources of financing first, then debt, and, finally, external equity obtained by stock issues. All being equal, the more profitable the firms are, the more internal financing they will have, and, therefore, the less leverage. In Mayer's (1984) pecking order theory, firms prefer internal financing over external, and in the case of firms with high retained earnings (profitability), they are likely to finance their investments with retained earnings instead of debt or equity. Following the pecking order theory, firms that have more retained earnings are in a better position to face fluctuation in interest rates since they have less debt. Thus, firms having a sound performance are less likely to face financial distress and, as such, issue utilized earnings as a means of financing their activities and short term debt or overdraft facilities; hence, borrow at a floating rate debt. As a result, the hypothesis is that firms having more earnings are more likely to have floating rate debt. Thus, we expect a positive relationship between profitability and floating rate debt.

6.3.6: Firm size

Large firms have access to bond markets since they have good reputations towards the capital market and are more reliable. Larger firms are more likely to have fixed rate debt. Several studies focus on the floating rate debt mix and utilise firm size as a determinant or a control variable (Chava and Purnanandam, 2007; Faulkender, 2005; Rokkanen, 2007; Covitz and Sharp, 2005; Antoniou *et al.*, 2009; and Vickery, 2008). As such, their findings are negative and

significantly related to floating rate debt ratio. In this study, market capitalisation is utilized as a proxy for firm size and the hypothesis that has been put forward is that large firms are less likely to have a floating rate debt.

6.3.7: Market Timing

Faulkender (2005) states that, if firms believe they can time the market, thereby reducing their cost of capital, then the interest rate exposure selection should be driven by movements in interest rates. Firms may believe, as suggested in the Harvard Business School case study “Liability Management at General Motors” (Tufano (1996)), that they can reduce their interest costs by “actively managing” their interest rate exposure as interest rates change. The hypothesis is that, when the yield curve is steep, firms that select a floating interest rate exposure will have significantly lower interest costs, at least in the short-term, than firms with a fixed exposure. This chapter employs the difference between the 10 year and 3 month UK treasury bills as a proxy for market timing.

6.4 Methodology

6.4.1 Model specification

This chapter employs both panel data and pooled regression methods to estimate the following model:

$$Y_{it} = \alpha_0 + \sum_{j=1}^k \beta_j X_{j,it} + \mu_i + e_{it} \quad \text{-Equation (8)}$$

Where i stands for the i^{th} cross-sectional unit and t for the t^{th} time period. μ_i stands for the firm specific errors and e_{it} is the general error term.

The dependent variable (Y_{it}) is the ratio of total floating rate debt to total debt. The explanatory variables denoted by X_j are as follows:

- Credit Rating

-
- Growth
 - Short term debt to maturity
 - Long term debt to maturity
 - Ratio of financial assets to financial liabilities
 - Firm Size
 - Profitability
 - Leverage
 - Yield Spread
 - $\mu_i + e_{it} = \text{composite error term}$

The composite error term consists of two components u_i and e_{it} (an individual random disturbance which adds to α_o when this effect is considered as fixed plus the white noise term).

6.4.2: Model selection

This section demonstrates the procedures undertaken to reach the final model. We start the econometric estimation in 2 steps: (1) we run the OLS regressions (in particular, we called it pooled OLS - one intercept and one slope); (2) we briefly discuss the convenience of fixed effect model versus random effect specification, as well as a battery of tests intended to help discern which is the best regression. Finally, this chapter shows the econometric results obtained in the best level equation in the next section.

6.4.2.1: Testing for the random effects.

We run the ordinary least squares (OLS) regression. However, OLS do not control for unobserved individual heterogeneity. If such unobservable effects are omitted, OLS estimates would be biased. In order to mitigate this potential bias, we proceed to test whether there are any unobserved effects.

We test the null hypothesis that the cross-sectional variance components are zero and time series variance components are zero by using the Lagrange Multiplier test. Breusch and Pagan (1980) developed the Lagrange Multiplier (LM) test (Green, 2003 and Judge *et al.*, 1988). If the null hypothesis is not rejected, the OLS²⁰ regression model is appropriate. However, if the null hypothesis is rejected, the random effect model is more appropriate. In random effect models, firm specific effects are captured as random variables, which are independent of the other regressors. However, this method considers the different firm specific terms as random elements and they are treated as a part of the error term. Therefore, in a random-effects model, the error term has two components: the traditional error unique to each observation and an error term representing the extent to which the intercept of the individual firm differs from the overall intercept.

6.4.2.2: Test for random effects versus fixed effects.

If the results of the above test tell us that we should not discard the random effect model, this does not conclude, on the other hand, that the fixed effect model should be ruled out. The fixed

²⁰ The OLS together with the LSDV are run in determining the model selection

effect estimation is similar to the random effect estimation as it consists of unobservable individual effect.

The question is how we compare a fixed effect model and its counterpart random effect model. The Hausman specification test compares the fixed versus random effects under the null hypothesis that the individual effects are uncorrelated with other regressors in the model (Hausman, 1978). If there is no such correlation, then the random effects model may be more powerful and parsimonious. If there is such a correlation (Ho is rejected), the random effects model produces biased estimators, violating one of the GAUSS-Markov²¹ assumptions; so a fixed effect model is preferred.

6.4.3: Controlling for potential endogeneity

The problem of endogeneity occurs when independent variable is correlated with the error terms in the regression model. This implies that the regression coefficient in any regression is biased. If it is the firm's policy to lower the cost of debt, both floating rate debt and leverage will be affected at the same time as the error terms are correlated with the leverage. Similarly, when firms have a policy of lowering interest expense, floating rate debt, short term debt to maturity and long term debt to maturity will be impacted. Thus, the models considered will suffer from endogeneity bias as leverage, and short and long term debt to maturity are correlated with the error terms in each of their respective regressions. As demonstrated by Chava and Purnanandan

²¹ Traditional Gauss-Markov assumptions

- $E(e_{it}) = E(u_i) = 0$
- $E(e_{it}^2) = \delta_e^2$
- $E(U_i^2) = \delta_U^2$
- $E(e_{it} U_j) = 0$ for all i, t and j .
- $E(e_{it} e_{js}) = 0$ if $t \neq s$ or $i \neq j$
- $E(u_i u_j) = 0$ if $i \neq j$

(2007), the inclusion of leverage could cause an endogeneity problem. However, in their study leverage was excluded and instead they utilized z-score as an instrument for leverage to control for testing the endogeneity problem.

6.4.3.1: Test for endogeneity

It is important to test for any endogenous variable in the model. We use the test which was first proposed by Durbin (1954), and separately by Wu (1973) and Hausman (1978). We define the null hypothesis which states that panel data estimator of the same equation would yield consistent estimates; that is, any endogeneity among the regressors would not have a deleterious effect on the estimates. A rejection of the null indicates that endogenous regressor effects on the estimates are meaningful and IV techniques are required.

6.4.2.2: IV estimation

In order to control for the endogeneity problem, an instrumental variable (IV) approach is employed. In this particular case, lagged values of the endogenous variables in the model provide natural candidates (Greene, 2000). Greene (2000) suggests that the best choice of instrument is a variable that correlates highly with the endogenous variable and is uncorrelated with the disturbances. For instance, if leverage is the endogenous variable, then we expect to use lagged leverage as an instrument (Green, 2000). The rationale is this year's floating rate debt ratio cannot influence last year's leverage. However, last year's leverage can have an effect on this year's floating rate debt ratio. Similarly, the same rationale is employed to both short and long term debt to maturity that is lagged short term and long term debt to maturity.

The remainder of this chapter discusses the findings, which take all the tests applied in this section into consideration to produce the final model selection.

6.5: Discussion of results

6.5.1: Determinant of the floating rate debt ratio: empirical evidence on all the firms in the sample.

Table 20 summarises the results of four models. It presents the findings of the random effect models. Prior to the final models of the random effect models in Table 20, the OLS regressions are run. The Lagrange Multiplier tests are performed to test whether there are any omitted variables. The results in Table 20 confirm that the null hypothesis (no omitted variables) is rejected in favour of the random effect model due to high chi square or statistically significant results of the Lagrange Multiplier. In addition, we use the Hausman specification test to compare the fixed versus random effects under the null hypothesis that individual effects are uncorrelated with other regressors in the model (Hausman, 1978). The results show the null hypothesis is not rejected (See Table 20 for the Hausman test); the random effect is more appropriate.

The results of Table 20 show that firms are mainly hedging instead of timing the market in determining their floating rate debt ratio. Model 1 and 2 in Table 20 show that firms are relying on interest rate swaps rather than the yield spread to decide on their floating rate debt ratio. Model 1 does not take into considerations both the year and industry dummy while model 2 does consider both the year and industry dummy. The negative coefficient of interest rate swap shows that firms are hedging from floating to fixed rate debt for the period year 1999-2004. Model 1 shows that firms are employing interest rate swap to determine their floating rate debt similar to the results of model 2. Model 3 and 4 have similar characteristics to model 1 and 2 respectively

where model is without year and industry dummy model 4 comprises of both industry and year dummy. Model 3 and 4 show that interest rate swaps are still the major factor affecting the floating rate debt ratio. The result, moreover, shows that that natural hedging and profitability are also important factors that help the financial manager to consider floating rate debt ratio. Natural hedging as measured by the ratio of financial assets to financial liabilities inform the financial manager that firms have more financial assets to cover the amount of financial liabilities. It also demonstrates that profitability which acts as a buffer has a positive coefficient when determining the floating rate debt. The positive coefficient of profitability shows that firms prefer to use profitability first as per the pecking order theory to control for floating rate debt then choose long term debt which is at a fixed rate debt. Table 20 also shows that firms accessing to capital markets are less likely to have floating rate debt ratio which inform the author that such firms are more likely debt from capital market at a fixed rate debt..

In general, Table 21 shows that firms are mainly hedging when choosing the floating rate debt ratio which is contrary to findings evidenced by Faulkender's (2005) who find that market timing is a determining factor for fixed and floating rate debt.

Table 20 : Determinants of Floating rate debt ratio for Panel Data Estimation

The dependent variable is the ratio of floating rate debt to total debt of the firm (in %). White heteroscedastic consistent errors, corrected for correlation across observations of a given firm, are reported in parentheses [Rogers (1993) and White (1980)]. Models 1 and 3 do not include year dummy and industry dummy whereas models 2 and 4 include year dummy variables and industry dummy variables. The sample is based on listed non-financial firms for the period between 1999 and 2004. *** indicates statistical significance at 1% level; ** indicates statistical significance at 5% level; * indicates statistical significance at 10% level.

	Model 1	Model 2	Model 3	Model 4
Interest rate swap	-0.0836*** (0.01802)	-0.075*** (0.019)	-0.0919*** (0.0226)	-0.0721*** (0.0229)
Yield spread	0.0056 (0.009)	0.0282 (0.0117)	0.003 (0.0106)	0.01249 (0.0131)
Natural hedging			0.0007*** (0.0001)	0.007*** (0.0001)
Credit rating			-0.0504** (0.0239)	-0.0426* (0.0242)
Profitability			0.0046*** (0.0016)	0.00456*** (0.0015)
Year Dummy	No	Yes	No	Yes
Industry Dummy	No	Yes	No	Yes
No. of observations	2147	2147	1529	1529
R²	0.01	0.080	0.02	0.02
Hausman Test	0.11	0.113	0.119	0.121
Lagrange Multiplier	388***	411***	396***	423***

Table 21 summarises the results of three models in determining the floating rate debt ratio. It presents the findings of the random effect models. Prior to the final models of the random effect models in Table 21, the OLS regressions are run together with the Lagrange Multiplier tests are performed to test whether there are any omitted variables. The results show that the null hypothesis (no omitted variables) is rejected in favour of the random effect model due to high chi square or statistically significant results of the Lagrange Multiplier in Table 21. In addition, the Hausman specification test is used to compare the fixed versus random effects under the null hypothesis that individual effects are uncorrelated with other regressors in the model (Hausman, 1978). The results show the null hypothesis is not rejected (See Table 21 for the Hausman test); the random effect is more appropriate. Following these tests, the Hausman

Wu test is employed to test any endogeneity among the regressors. Long term debt to maturity, short term debt to maturity and leverage are endogenous in Model 1, Model 2 and Model 3 respectively. We then apply the lag long term debt to maturity, lag short term debt to maturity and lag leverage as instrument of long term debt to maturity (Model 1), short term debt to maturity (Model 2) and leverage (Model 3) respectively. The lag value is correlated with the endogenous variable, but not correlated with the disturbance terms (Greene, 2000).

Table 21 presents determinants of the floating rate debt ratio of three IV regression models. The dependent variable for all models is the ratio of floating rate debt to the total debt in Table 21. White heteroscedastic consistent errors, corrected for correlation across observations of a given firm, are reported in parentheses (Rogers, 1993 and White, 1980). Overall, we observe that the determinants (ratio of financial assets to financial liabilities, credit rating, firm size, capital expenditure to sales, short term debt to maturity, long term debt to maturity and leverage) turn out to be highly statistically significant. Also, all our variables turn out to have the expected sign.

More specifically, we find that two variables are statistically significant in Model 1. The ratio of financial assets to financial liabilities and long term debt to maturity are the key determinants of the floating rate debt ratio. Debt to maturity greater than 5 years is negatively related to the floating rate debt ratio.

The positive coefficient of the ratio of financial assets to financial liabilities confirms that firms are matching the interest rate profile of their financial liabilities to that of their financial assets.

This strategy shows that firms naturally hedge their interest rate risk profile to lower any volatility in their cash flows.

The negative coefficient of the long term debt to maturity with respect to floating rate debt indicates that firms are less likely to have floating rate debt as long term debt to maturity prefer fixed rate debt. Also fixed rate debt can avoid any fluctuation in interest rates. Thus, long term debt to maturity lowers a firm's cash flow volatility and can also prevent bankruptcy.

Model 2 utilises similar variables to Model 1. Model 2 include short term debt to maturity instead of long term debt to maturity (Model 1). Model 2 illustrates five variables statistically significant for the random effect model. The coefficients of the ratio of financial assets to financial liabilities and short term debt to maturity are positively related to the floating rate debt. The positive coefficient of the natural hedge (ratio of financial assets to financial liabilities) hypothesis indicates that firms prefer to match the interest rate profile of their financial assets to their financial liabilities. As expected, short term debt to maturity is positively related to floating rate debt. This result is positive as short term debt is normally borrowed from banks at a floating rate. A 1% increase of short term debt to maturity will increase floating rate by 27.65%. The increase could be attributed to firms dependent on banks, as such firms are more likely to have short term debt. Thus, short term debt to maturity is a key determinant of floating rate debt. However, credit rating, capital expenditure to sales and firm size are negatively related to the dependent variable. The credit rating, which is a proxy for firms having access to external funds, is a key determinant for floating rate debt. Since the coefficient of credit rating is negative, it gives an indication that firms having access to external debt are more likely to have less floating rate debt. This is consistent with Covitz and Sharp (2006), Antoniou *et al.*

(2009), and Chava and Purnanandam (2007). It informs the author that firms that have good credit quality rely more on fixed rate debt as the cost of accessing funds is cheaper and easier for firms having access to capital as they have already build a good credit rating. Capital expenditure to sales, a proxy for growth opportunities, is statistically significant at 5%. Thus, firms with growth opportunities prefer to have less floating rate debt. The economic rational is that firms with growth opportunities prefer not to have floating rate debt as they prefer to have a stable interest rate else can affect their cash flow. This evidence is consistent with Faulkender (2005), and Chava and Purnanandam (2007). Finally, large firms are less likely to have floating rate debt, consistent with previous studies (Faulkender, 2005, Antoniou *et al.*, 2009, Vickery, 2008 and Rokkanen, 2007, and Chava and Purnanandan, 2007). There is no significant effect of our proxy for market timing, similar to Chava and Purnanandam (2007), and for interest rate swap. The rational for large firms is that they can, access to the capital market, minimise their risk by using derivatives and less likely to financial distress. Thus, firms are less likely to have floating rate debt.

Model 3 takes into consideration leverage as a proxy for financial distress in the IV regression. Model 3 shows that the coefficient of lag leverage (as an instrument for leverage) is negative and statistically significant. Thus, leverage is an important factor in determining the floating rate debt ratio. This is consistent with Chava and Purnanandam (2007). Leverage is negative as firms which are close to financial distress prefer control for their cash flows and interest rate and hence, have less floating rate debt. Model 3 also finds the ratio of financial assets to financial liabilities positively related to floating rate debt ratio. Credit rating, market capitalisation and capital expenditure are negatively and significantly related to floating rate

debt. This finding is consistent with the empirical findings of Chava and Purnanandam (2007), who shows that rated firms, firm size, growth opportunities and financial distress are the determinants of fixed and floating rate debt ratio.

Although this study is part of the capital structure, it gives financial managers reason to believe that the financing of their fixed and floating rate debt depends on the financial characteristics of firms. Using a comprehensive dataset, this study provides new evidences for UK non-financial firms for outstanding debt. It demonstrates that firms that have access to capital markets are more likely to have fixed rate debt. It follows that large firms provide evidence of securing fixed rate debt, while distressed firms (highly levered firms) avoid riskier financing strategies by choosing less floating rate debt. This section shows that financial management needs to focus on the value of financial assets and financial liabilities in issuing their debt structure. The ratio of financial assets to financial liabilities shows that firms consider internal hedging when deciding on their floating rate debt ratio. High levels of financial assets suggest that firms have high levels of short term investments which can act as a natural hedge when netted to financial liabilities. These findings are broadly consistent with risk management theoretical findings.

Table 21: Determinants of floating rate debt: IV regression for panel data estimation (Random Effect Model)

The dependent variable of Table 22 is the ratio of floating rate debt to the total debt. White heteroscedastic consistent errors, corrected for correlation across observations of a given firm, is reported in parentheses (Rogers, 1993 and White, 1980). The sample is based on listed non-financial firms (with interest rate debt usage only) for the period between 1999 and 2004. Table 22 demonstrates panel data with time fixed effect and industry effect. *** indicates statistical significance at 1% level; ** indicates statistical significance at 5% level; * indicates statistical significance at 10% level.

	Model 1	Model 2	Model 3
Credit Rating	-0.3905 (0.296)	-0.4198* (0.2425)	-0.3907* (0.2364)
Ratio of financial assets to financial liabilities	0.006** (0.003)	0.007** (0.003)	0.006* (0.003)
Profitability	0.003022 (0.0029)	0.003 (0.0028)	0.0023 (0.0029)
Size	-0.0181 (0.0123)	-0.0244** (0.0105)	-0.0298*** (0.01056)
Interaction Credit rating and Firm size	0.0243 (0.0207)	0.0271 (0.0172)	0.0252 (0.0167)
Debt to maturity < 1 year (I*)		0.2765*** (0.0929)	
Debt to maturity >5 years (I*)	-0.2636*** (0.0926)		
Capital expenditure to sales	-0.0753 (0.0908)	-0.1466** (0.0737)	-0.1969*** (0.0683)
Yield spread	0.0112 (0.0214)	0.0146 (0.0173)	0.0978 (0.0176)
Interest rate swaps	-0.0475 (0.03008)	-0.003 (0.0277)	-0.0289 (0.0255)
Leverage (L*1)			-0.1944* (0.1031)
Year dummy	yes	Yes	yes
Industry dummy	yes	Yes	yes
Number of observations	747	1116	1160
Overall R-Squares	0.14	0.13	0.14
Hausman test	0.288	0.35	0.66
Lagrangian Multiplier (Chi²)	160.94***	167.72***	197.71***
Wu-Hausman F test	0.21	0.22	0.26

Source: Author

Debt to maturity < 1 year (I*)=lag of debt to maturity < 1year is the instrument variable for debt to maturity for more than 5 years,

Debt to maturity > 5 years (I*)=lag of debt to maturity>5 years is the instrument variable for debt to maturity for more than 5 years

$L^*I=L_{(t-1)}$ is the instrument variable for leverage

6.5.2 Determinant of floating rate debt ratio: special attention to interest rate swap usage firms and non interest rate swap usage firms.

The analysis in the previous section presents the results of all the firms in the sample. When deciding between fixed and floating rate debt, firms consider the existing level of interest rate exposure. An adequate mix of fixed and floating rate debt ensures diversification of exposure and acts as a natural hedge. Generally, when choosing a debt contract that is correctly aligned with their desired interest rate exposure, that is appropriate financial assets and financial liabilities, firms can also alleviate their interest rate risk exposure by entering an accompanying derivative contract. Firms issuing fixed rate debt have the same interest rate exposure and, therefore, receive the same benefits of smooth cash flows, as those that issue floating rate debt and swap to fixed (Faulkender, 2005). Yet, some have often equated firms that borrow floating rate debt and swap to fixed rate debt as being hedgers, while fixed rate debt users that do not swap were considered non hedgers (Mian, 1996; Nance, Smith and Smithson, 1993). Firms may manage their interest rate risk by means other than derivative usage. Thus, firms without any derivative instrument would try to manage their risk by means other than derivatives which involves restructuring the company assets and liabilities in a way that minimises interest rate exposure. These include:

Smoothing – the company tries to maintain a certain balance between its fixed rate and floating rate borrowing. The portfolio of fixed- and floating-rate debts thus provides a natural hedge against changes in interest rates.

Matching – the company matches its assets and liabilities to a common interest rate. If a company borrows to finance an investment receiving a floating interest rate, the loan will be taken at floating interest rate.

Netting – In netting, the company aggregates all positions, both assets and liabilities, to determine the net exposure.

One question that is important when considering the fixed and floating rate debt is whether firms which employ interest rate derivatives (here, interest rate derivatives are considered as hedgers) are likely to utilize internal hedging techniques or concentrate on only derivatives. This section acts as a robustness test to clarify whether there are any differences with respect to internal hedging when firms are considered as hedgers and non hedgers. The sample is therefore split into two segments to test the behaviour of firms with respect to the floating rate debt. The two segments are firms with interest rate swap usage (hedgers) as a measure of derivative, and without interest rate swap (non hedgers). We expect firms that utilize derivative instruments less likely to rely on natural hedge strategy. However, firms without derivative instruments will prefer internal hedging techniques to reduce their fluctuation in interest rate.

This section starts by running the OLS. It moves on to test whether OLS is the appropriate method by employing the Lagrange Multiplier test. The latter test gives an indication whether OLS has omitted variables compared to the random effect model. If the random effect is accepted, the Hausman test is employed to test whether fixed effect or random effect is the best specification for the model.

The results of the tests are illustrated in Table 22 (firms with interest rate swap usage) and Table 23 (firms without interest rate swap usage). The results of Tables 22 and 23, show that the OLS has omitted variables when employing the Lagrange Multiplier test. The high values of the chi square test and highly significant Lagrange Multiplier show that the OLS method is rejected. Moreover, the results of the Hausman tests in Tables 22 and 23 show that the model explores the differences in error variance (random effect model) instead of assuming the differences in intercepts across groups or time periods (fixed effects).

Finally, we test for endogeneity as in the previous section. Long term debt to maturity, short term debt to maturity and leverage are endogenous in their respective models. The three variables are directly related to the floating rate debt ratio and so are the error terms. As discussed in the previous section, the lag of long term debt to maturity, the lag of short term debt to maturity and lag of leverage are used as instrument variables respectively to control for the endogeneity problem. The results of the instrumental variable regressions are shown in Table 22 and Table 23.

6.5.2.1: Firms with interest rate swaps usage

Table 22 summarises the findings of IV regressions of firms considering only interest rate swap usage as a measure of derivative. Since the Lagrange Multiplier test shows that OLS is not appropriate, as shown in Table 22, we present the results of the random effect models. By utilizing the Hausman test, the results in Table 22 show that the random effect is more appropriate than the fixed effect models. Model 1 in Table 22 shows credit rating, firm size and debt to maturity after five years are key determinants to the floating rate debt ratio. The three variables are negatively and significantly related to floating rate debt. Maturity of debt greater

than 5 years in table 22 is consistent with Table 21. Maturity greater than five years show that firms prefer to have fixed rate debt in the long term to avoid any fluctuation in interest rates and cash flow. Moreover, the benefits of credit ratings are not only in terms of widening the investor base and potentially improving pricing, but also in terms of gaining international visibility and reducing reliance on local banks for debt funding. For example, credit rating enables firms to diversify their sources of funding by tapping the debt capital markets, such as the Eurobond markets, which provide an additional source of finance and, in particular, long-term finance (having maturity of debt greater than 5 years). It follows from this that we should expect to find that, since a credit rating provides access to an additional source of debt (via the public debt market), companies with a credit rating should have less floating rate debt, as any change in the market conditions (increase in interest rate) can affect the cost of debt, thereby lowering the firm's earnings. Moreover, firm size appear to be negative which gives rise to larger firms having the tendency to tap into longer term debt, hence preferring lower floating rate debt.

Model 2 in Table 22 demonstrates that credit rating and firm size are negatively and significantly related to floating rate debt informing the author that firm accessing to capital market prefer fixed rate debt. Thus, firm size, as measured by the natural logarithm of market capitalisation, tends to have lower floating rate debt ratio. An increase of 1% in the natural logarithm of market capitalisation will decrease floating rate debt ratio by 4.48%. This finding is consistent with Table 21. Firms that do not have access to public debt markets are constrained by lenders such as banks as to the amount of debt capital they may raise. For this reason, short term debt to maturity has significantly more floating rate debt ratio as the debt is borrowed mostly from banks. Moreover, the interaction of credit rating and firm size (product of credit rating dummy and

market capitalisation) are positive and statistically significant showing that both credit rating and firm size move in the same direction. This suggests that the large firms in this sample are more likely to have credit ratings in this sample.

Finally, the last model, in Table 22, displays that credit ratings and market capitalisation are negatively related to floating rate debt ratio when considering only firms with interest rate swap usage which are similar to model 1 and model 2. Leverage is also negatively and significantly related to floating rate debt. It shows that firms are less likely to risk themselves to have floating rate debt as any fluctuation in interest rate could yield firms to financial distress and hence, bankruptcy.

The overall results show that firms employing interest rate swaps do not significantly utilize internal hedging techniques to smooth their cash flows. Firms can adjust their interest rate profile from fixed to floating rate of interest (and vice versa) by using a financial derivative whenever there is any fluctuation in interest rates. The results of all models in Table 22 show that natural hedging is not significant. This confirms that natural or internal hedging strategy employed in this study is not a significant strategy when firms utilize interest rate swaps. Although this section mainly focuses on firms with interest rate swap usage only, it finds that firms have to consider sources of debt (credit rating), firm size, short term debt to maturity, long term to maturity and leverage when determining their floating rate debt ratio.

Table 22: Determinants of Floating rate debt: IV regression for Panel Data Estimation (Random Effect Model and Interest rate swap usage only)

The dependent variable in this table is the ratio of floating rate debt to the total debt after running IV regression. White heteroscedastic consistent errors, corrected for correlation across observations of a given firm, is reported in parentheses (Rogers, 1993 and White, 1980). The sample is based on listed non-financial firms (with interest rate debt usage only) for the period between 1999 and 2004 *** indicates statistical significance at 1% level; ** indicates statistical significance at 5% level; * indicates statistical significance at 10% level.

	Model 1	Model2	Model 3
Credit Rating	-0.9260** (0.3897)	-0.8743*** (0.3216)	-0.9044*** (0.3267)
Ratio of financial assets to financial liabilities	0.00003 (0.00005)	0.00003 (0.00005)	0.00004 (0.00005)
Profitability	0.0014 (0.0036)	0.00134 (0.0029)	0.0019 (0.0036)
Firm Size	-0.0346* (0.01936)	-0.0448*** (0.0156)	-0.0608*** (0.01564)
Interaction Credit rating and Firm size	0.0606** (0.0275)	0.0583** (0.0228)	0.0626 (0.0231)
Debt to maturity < 1 year (I*)		0.3353** (0.1529)	
Debt to maturity >5 years (I*)	-0.1839* (0.0962)		
Capital expenditure to sales	-0.0173 (0.1109)	0.0349 (0.1035)	-0.0034 (0.0997)
Yield spread	0.01799 (0.0247)	0.0152 (0.0216)	0.00789 (0.0209)
Leverage (L*1)			-0.4104*** (0.1444)
Year dummy	yes	Yes	Yes
Industry dummy	yes	Yes	Yes
Number of observations	644	482	645
Overall R-Squares	0.10	0.11	0.10
Hausman test	0.2885	0.325	0.277
Lagrangian Multiplier (Chi2)	95.35***	96.87***	156.31***
Wu-Hausman F test	0.19	0.20	0.23

Source: Author

Debt to maturity < 1 year (I*)=lag of debt to maturity < 1year is the instrument variable for debt to maturity for less than one year

Debt to maturity > 5 years (I*)=lag of debt to maturity>5 years is the instrument variable for debt to maturity for more than 5 years

L*1=L_(t-1) is the instrument variable for leverage

6.5.2.2 Determinant of floating rate debt ratio: sample of firms with non interest rate swap usage

This section explains the effect of firms which do not utilize interest rate swap in determining the floating rate debt ratio. The dependent variable in Table 23 is the total floating rate debt ratio and the explanatory variables are identical to that of Table 21.

After running the OLS and testing for any omitted variables by employing the Lagrange Multiplier test (Table 23), the findings show that the random effect is more appropriate. We then employ the Hausman test to determine which method is the more appropriate: the fixed effect or the random effect model. The Hausman test in Table 23 shows that the random effect is the better approximation. Moreover, the long term debt to maturity, short term debt to maturity and leverage are potential variables that can cause the endogeneity problem. We employ IV regression in Table 23 where lag of long term debt to maturity, lag short term debt to maturity and lag leverage are instruments of long term debt to maturity, short term debt to maturity and leverage in Models 1, 2 and 3 respectively to eliminate the endogeneity problem.

The overall findings (the findings of model 1,2 and 3) of Table 23 illustrate that the ratio of financial assets to financial liabilities is positively and significantly related to floating rate debt ratio. Unlike firms with interest rate swap usage which did not consider the natural hedge strategy, this section shows evidence that firms choose the strategy to match the interest rate profile of their financial liabilities to their financial assets to avoid interest rate risk. The ratio of financial assets to financial liabilities gives an indication that more liquidity (in terms of more short term investments and deposits) is available, which can act as a buffer to absorb any unexpected change in the market.

Model 1 in Table 23 shows the ratio of financial assets to financial liabilities and debt to maturity greater than 5 years as statistically significant. It demonstrates that firms have internal cash holdings from the ratio of financial assets to financial liabilities manage the risk of interest rate

fluctuation. It moreover, finds consistent results with Table 21 and 22 with respect to debt to maturity. The results demonstrate that debt to maturity is negatively related to floating rate debt as firms prefer to fixed rate debt. Model 2 displays a positive relationship between both the ratio of financial assets to financial liabilities and debt to maturity with respect to floating rate debt ratio. The positive coefficients suggest that firms with more internal cash flow and short term debt to maturity have more floating rate debt. Growth opportunities proxy (capital expenditure to sales) is negatively related to the floating rate debt. The negative relationship informs the author that when firms have growth opportunities, they prefer to avoid any fluctuation in interest rates and cash flows for the smooth running of the business by employing fixed rate debt. Model 3 shows that only the ratio of financial assets to financial liabilities and capital expenditure to sales are statistically significant. This result is quite similar to Model 2; however, in Model 3, leverage is not statistically significant.

The overall findings in this section are consistent with the results when the entire sample in Table 21 is considered. This section demonstrates the robustness test and shows that firms which do not employ derivative instruments, such as interest rate swaps, rely on internal cash holdings (ratio of financial assets to financial liabilities) to manage their exposure to fluctuations in interest rates naturally. This section demonstrates that firms can use interest rate swaps or means other than interest rate swaps when choosing their debt structure.

This section differentiates between firms with interest rate swap usage and firms without interest rate swap usage with regard to floating rate debt ratio. This differentiation is to find out whether there is any form of risk management involved when considering floating rate debt ratio. The results show that although firms are not considering external derivatives usage, they prefer to hedge their exposure internally by netting when they are non hedgers and also have no

significance to internal hedging when firms are hedgers. It shows that firms still consider to naturally hedging their risk when choosing the floating rate debt ratio although they are non-hedgers. When financial managers decide the appropriate mix of fixed or floating rate debt, they consider risk management, be it internal hedging or external hedging.

Table 23: Determinants of floating rate debt: IV regression for panel data estimation (Random Effect Model) and (Non-interest rate swap usage firms only)

The dependent variable in this table is the ratio of floating rate debt to the total debt after running IV regression. White heteroscedastic consistent errors, corrected for correlation across observations of a given firm, is reported in parentheses (Rogers, 1993 and White, 1980). The sample is based on listed non-financial firms (with interest rate debt usage only) for the period between 1999 and 2004 *** indicates statistical significance at 1% level; ** indicates statistical significance at 5% level; * indicates statistical significance at 10% level.

	Model 1	Model 2	Model 3
Credit Rating	0.2469 (0.7276)	-0.05679 (0.4846)	0.0749 (0.4875)
Ratio of financial assets to financial liabilities	0.006* (0.003)	0.007** (0.003)	0.006* (0.004)
Profitability	0.0044 (0.0052)	0.002 (0.0047)	0.0017 (0.005)
Firm Size	0.00284 (0.0188)	-0.0123 (0.0159)	-0.0067 (0.0173)
Interaction Credit rating and Firm size	0.0192 (0.05413)	-0.0001 (0.0363)	-0.0118 (0.0365)
Debt to maturity < 1 year (I*)		0.2157* (0.1124)	
Debt to maturity >5 years (I*)	-0.4752** (0.1971)		
Capital expenditure to sales	-0.0766 (0.1774)	-0.2876** (0.1173)	-0.3461*** (0.1084)
Yield spread	-0.0278 (0.0531)	0.0058 (0.0369)	-0.0172 (0.0369)
Leverage(L*1)			0.0516 (0.1629)
Year dummy	Yes	Yes	Yes
Industry dummy	Yes	Yes	Yes
Number of observations	230	406	449
Overall R-Squares	0.22	0.16	0.12
Hausman test	0.232	0.153	0.288
Lagrangian Multiplier (Chi2)	122.94***	113.32***	130.44***
Wu-Hausman F test	0.11	0.15	0.18

Source: Author

Debt to maturity < 1 year (I*)=lag of debt to maturity < 1year is the instrument variable for debt to maturity for less than 1 year,

Debt to maturity > 5 years (I*)=lag of debt to maturity>5 years is the instrument variable for debt to maturity for more than 5 years

$L*1=L_{(t-1)}$ is the instrument variable for leverage

6. 5.3: Determinant of the floating rate debt ratio: smaller firms only.

Section 6.5.1 (p.152) and section 6.5.2 (p.160) analysed the entire sample and the differentiation between firms as interest rate swap users and non interest rate swap users. As a robustness test, this section attempts to determine the floating rate debt of smaller firms in this dataset as a robustness test following the same specifications as in Table 21. Smaller firms in this dataset are defined as firms whose market capitalisations are less than the median. Generally, small firms attempt to match the interest rate profile of debt with short term investment as a natural hedge instead of employing derivative instruments. Another aspect frequently asked about small firms is whether firms dependent on banks have floating rate debt ratio.

We first run the OLS and test for omitted variables by employing the Lagrange Multiplier (see Table 24 for Lagrange Multiplier test). The results show that OLS is discarded in favour of the random effect. Moreover, we employ the Hausman tests to test whether the fixed effect model is a better approximation than the random effect model. The results of the Hausman test in Table 24 show that the random effect is more appropriate. Table 24 displays the results of the random effect models for small firms within this dataset. Model 1 shows three variables having statistically significant coefficients. The ratio of financial assets to financial liabilities and the debt to maturity are positively and significantly related to the floating rate debt ratio. The findings illustrate that firms are matching the interest rate profile of financial liabilities to that of financial assets in determining the floating rate debt ratio. It means the more financial assets to financial liabilities firms have the more it can cover the interest rate cost from the interest income. An increase of 1% in the natural hedge proxy will lead to a 0.7% increase in the floating rate debt. The lag of debt to maturity less than one year which is an instrument for debt less than one year is positively related to floating rate debt ratio for smaller firms in the sample.

It confirms that smaller firms with short term debt may be better off borrowing debt from banks than capital market, which is at a floating rate debt. Moreover, the proxy for growth opportunities, capital expenditure to sales, is negatively related to floating rate debt. It shows that firms with more growth opportunities are less likely to have floating rate debt as these types of firms as they may prefer stable cash flows to stabilise their growth.

Model 2 shows that two variable are important when analysing smaller firms in the sample. The ratio of financial assets to financial liabilities is positively related to floating rate debt. This suggests that smaller prefer natural hedging to external techniques to hedge their interest rate risk when determining the floating rate debt. Smaller firms having long term to maturity (maturity greater than 5 years) is negatively related to floating rate debt ratio. The result demonstrates that firms which prefer long term debt to maturity have less preference for floating rate debt as floating rate debt can fluctuate in the long run and affect their cash flows. Thus, fixed rate debt is preferred for firms with long term debt to maturity.

Model 3 shows that the natural hedging as measured by the ratio of financial assets to financial liabilities and growth opportunities as measured by capital expenditure to sales are the two variables affecting the floating rate debt ratio. The overall results confirm that smaller firms in the sample are matching the interest rate profile of their financial liabilities to financial assets (cash and short term investments). The proxy for growth opportunities has a negative sign and is statistically significant. This is consistent with Chava and Purnanandam (2007) who measured growth opportunities by market to book value.

Table 24: Determinants of floating rate debt: IV regression for panel data estimation (Random Effect Model) and (Smaller firms only)

The dependent variable in this table is the ratio of floating rate debt to the total debt after running IV regression. White heteroscedastic consistent errors, corrected for correlation across observations of a given firm, is reported in parentheses (Rogers, 1993 and White, 1980). The sample is based on listed non-financial firms (with interest rate debt usage only) for the period between 1999 and 2004 *** indicates statistical significance at 1% level; ** indicates statistical significance at 5% level; * indicates statistical significance at 10% level.

	Model 1	Model 2	Model 3
Credit Rating	-0.7957 (1.0455)	0.1615 (0.1400)	-0.0763 (0.1059)
Ratio of financial assets to financial liabilities	0.007** (0.003)	0.007** (0.003)	0.006* (0.004)
Profitability	0.0024 (0.0049)	0.0044 (0.0053)	0.0002 (0.005)
Firm Size	-0.0159 (0.017)	-0.0089 (0.0207)	-0.01304 (0.02158)
Interaction Credit rating and Firm size	0.0660 (0.089)	-0.01335 (0.1163)	0.0624 (0.0912)
Debt to maturity < 1 year (I*)	0.2255** (0.1108)		
Debt to maturity >5 years (I*)		-0.3396** (0.1595)	
Capital expenditure to sales	-0.2395** (0.1197)	-0.0585 (0.1867)	-0.3492*** (0.1144)
Yield spread	0.0131 (0.0355)	-0.0214 (0.0481)	-0.007 (0.0336)
Leverage(L*1)			-0.0880 (0.1974)
Year dummy	Yes	Yes	Yes
Industry dummy	Yes	Yes	Yes
Number of observations	441	252	482
Overall R-Squares	0.11	0.14	0.07
Hausman test	0.226	0.135	0.228
Lagrangian Multiplier (Chi2)	116.49***	109.23***	113.33***
Wu-Hausman F test	0.12	0.14	0.19

Source: Author

Debt to maturity < 1 year (I*)=lag of debt to maturity < 1year is the instrument variable for debt to maturity for less than 1 year.

Debt to maturity > 5 years (I*)=lag of debt to maturity>5 years is the instrument variable for debt to maturity for more than 5 years

$L*1=L_{(t-1)}$ is the instrument variable for leverage

6.5.4: Determinant of the Changes in floating rate debt ratio.

Table 25 shows the changes in the floating rate debt ratio. Changes in the floating rate debt shows increases or decreases from this year as compared to previous year's floating rate debt ratios. This section uses the same methodologies to analyse the results in Table 25 by regressing the changes of the independent variables on the changes of the floating rate debt as the dependent variable. Prior to the final models of the random effect models in Table 25, the OLS regressions are run. The Lagrange Multiplier tests are performed to test whether there are any omitted variables. The high values of the chi squared tests show that the null hypothesis (no omitted variables) is rejected in favour of the random effect model. In addition, the Hausman specification test is used to compare the fixed versus random effects under the null hypothesis that individual effects are uncorrelated with other regressors in the model (Hausman, 1978). The results show the null hypothesis is not rejected (See Table 25 for the Hausman test); the random effect is more appropriate.

Table 25 shows the IV regression of the changes in the floating rate debt ratio where potential endogeneity problems, from changes of short term debt to maturity (Model 1), changes of long term debt to maturity (Model 2) and changes of leverage (model 3), are controlled. These three models have same specifications as in Table 21. Model 1 demonstrates that changes of profitability and changes of debt to maturity less than 1 year are positively related to changes in floating rate debt ratio. It demonstrates that firms having profitability have more floating rate debt as profitability acts as a security to cover any fluctuations in cash flows arising from changes in floating rate debt. The positive relationship between changes in floating rate debt ratio and changes in short term debt to maturity confirms the result of Table 21, 22 and 23. It shows that short term debts to maturity are debts borrowed from banks which are normally at a floating rate. Model 2 shows that changes of long term debt to maturity is negatively related to changes in floating rate debt ratio which is consistent with Tables 21,22 and 23. It suggests that

firms having long term debt to maturity prefer to avoid any variations in floating rate debt to avoid changes in cash flows. Model 3 shows that changes in profitability as measured by return on investment is positively related to changes in floating rate debt while changes of firms size as measured by market capitalisation is negatively related to the changes in floating rate debt ratio. The negative result means that the larger the firms the can diversify their risk and can access to capital market to borrow funds. Thus, are better off at having a fixed rate debt.

Table 25: Changes in floating rate debt: IV regression for panel data estimation (Random Effect Model).

The dependent variable in this table is the changes in the ratio of floating rate debt to the total debt after running IV regression. White heteroscedastic consistent errors, corrected for correlation across observations of a given firm, is reported in parentheses (Rogers, 1993 and White, 1980). The sample is based on listed non-financial firms (with interest rate debt usage only) for the period between 1999 and 2004 *** indicates statistical significance at 1% level; ** indicates statistical significance at 5% level; * indicates statistical significance at 10% level.

	Model 1	Model 2	Model 3
Credit Rating	-0.2855 (0.3887)	-0.7502 (0.5088)	-0.3134 (0.3773)
Ratio of financial assets to financial liabilities	-0.0003 (0.0005)	-0.0005 (0.0004)	-0.0004 (0.005)
Profitability	0.029* (0.0159)	0.0317 (0.0240)	0.0283* (0.0169)
Firm Size	-0.02723 (0.0176)	-0.02674 (0.02247)	-0.0308* (0.0175)
Interaction Credit rating and Firm size	0.0199 (0.0277)	0.04992 (0.0358)	0.0223 (0.0268)
Debt to maturity < 1 year (I*)	0.3834** (0.1708)		
Debt to maturity >5 years (I*)		-0.3856** (0.1618)	
Capital expenditure to sales	-0.5863 (0.1172)	0.0826 (0.1434)	-0.5421 (0.1074)
Yield spread	0.01603 (0.0282)	0.02816 (0.03556)	0.0136 (0.0281)
Leverage(L*1)			-0.1585 (0.1733)
Year dummy	Yes	Yes	Yes
Industry dummy	Yes	Yes	Yes
Number of observations	896	581	937
Overall R-Squares	0.06	0.11	0.06
Hausman test	0.198	0.177	0.264
Lagrangian Multiplier (Chi2)	131.26***	123.53***	109.11***
Wu-Hausman F test	0.12	0.16	0.17

Source: Author

Debt to maturity < 1 year (I*)=lag of debt to maturity < 1year is the instrument variable for debt to maturity for less than 1 year;

Debt to maturity > 5 years (I*)=lag of debt to maturity>5 years is the instrument variable for debt to maturity for more than 5 years

$L*1=L_{(t-1)}$ is the instrument variable for leverage

6.6: Conclusion

This chapter examines the determinants of the floating rate debt mix of UK non-financial firms for the period 1999-2004. The descriptive statistics are discussed and in certain circumstances are compared to the US. The models are presented by employing random effect models for the whole sample and other sections of the chapter (Section 6.5.2, p.160) is characterised by firms with interest rate swap usage and firms without interest rate swap usage. Section 6.5.3 (p.170) of this chapter discusses the behavior of smaller firms in this dataset towards the floating rate debt ratio and the last section discusses the changes in the floating rate debt ratio.

An interesting finding is the positive relationship between the ratio of financial assets to financial liabilities and the floating rate debt ratio. This result is confirmed when analyzing firms without interest rate swap usage and smaller firms in the dataset of non-financial firms. It is a key determinant for the overall sample as it acts as a natural hedge strategy for firms wishing to match the interest rate profile of debt to that of short term investments. Other studies, such as Chava and Purnanadam (2007), and Faulkender (2005), employ cash flow beta (p59.) and interest rate beta (p58) in an attempt to hedge their interest rate risk but do not find any significance. This chapter shows that non financial firms are more likely to hedging than market timing when considering floating rate debt.

By employing panel data with random effect models, credit rating appears to be negatively and significantly related to floating rate debt. The result explains that firms having access to the bond market are more likely to have less floating rate debt. The expectations of short term debt and long term debt to maturity are as expected and significant. Firm size, which is an important determinant of floating rate debt ratio, is negative and statistically significant. The results demonstrate that large firms prefer fixed rate debt so as to avoid any change in the rate of interest.

Finally, growth variables appear to be significant and negative, which concludes that firms with growth opportunities prefer fixed rate debt to avoid any adverse effect in interest rate fluctuations.

In order to compare the determinants of floating rate debt of interest rate swap usage and non interest rate swap usage, the sample is divided into two groups. The analysis displays the results for the random effect models. The main result is that firms not employing interest rate swaps as a derivative instrument prefer to match the interest rate profile of financial liabilities with that of the financial assets. However, the results illustrate that firms employing interest rate swaps do not find any evidence of natural hedge.

Smaller firms in this novel database have a tendency to match the interest rate profile of debt to short term investments, which is positive and significant in all cases. This means that smaller firms prefer to match their debts with short term investments rather than attempting to use derivative instruments to manage their debts.

Following partially the study of Chava and Purnanandam (2007), this study provides new evidences for UK non-financial firms by using a comprehensive dataset for the period 1999-2004. UK outstanding debt in the area of fixed and floating rate debt have not been tested prior to this study according to the researcher's knowledge. Non-financial firms in the UK prefer floating rate debt when financial managers can naturally hedge their debt exposure. However, when firms have, access to capital market, high leverage and large in terms of size and have growth opportunities, financial managers of non-financial firms are less likely to have floating rate debt.

Chapter 7: Composition of Floating Rate Debt Ratio: new empirical evidence from UK non-financial firms

7.1: Introduction

This chapter's aim is to analyse the determinants of the composition of floating rate debt ratio for non-financial firms in UK for the period 1999-2004. The purpose of this chapter is to find out whether firms with foreign debt are hedging their foreign currency derivatives in determining their composition of foreign floating rate debt. Chapter 3 critically evaluates the extent of the empirical literature on the determinants of the fixed and floating debt mix. Chapter 6 analyses the extent of the total floating rate debt of non-financial firms. We find that natural hedge, interest rate swaps, credit rating and firm size are key determinants of the total floating rate debt and UK non financial firms prefer to consider hedging than timing the market when choosing their floating rate debt. Studies on capital structure decision has also focused on the currency denomination of debt (Allayannis et al., 2003; Miller and Puthenpurackal, 2002; Chaplinsky and Ramchand, 2001; Kedia and Mozumdar, 2003) and on the fixed and floating debt mix, as explained in Chapter 3, Chava and Purnanandam (2007) and Faulkender and Chernenko (2006) focus their studies on outstanding debt and account only for the total floating rate debt ratio. Whilst previous studies clarify our understanding of total floating rate debt choices, the analysis of the currency denomination of floating rate debt is lacking from other studies.. This is important mainly for non financial firms in UK which raise large amount of foreign debt to finance their investments. Also firms may consider converting their foreign debt into domestic currency by focussing on the foreign currency derivatives.

In this chapter, the author examines the determinants of the composition of floating rate debt ratio for UK non-financial firms. This type of analysis is dealt as firms have liabilities

denominated in foreign currency, primarily the US dollar and the Euro. It also examines the factors affecting foreign debt which consists mainly of foreign currency derivatives and foreign operations. Using a dataset of UK non-financial firms for the period 1999-2004, this chapter analyse the composition of the foreign debt and foreign floating rate debt ratio. This chapter is possible mainly due to the accessibility of information collected from annual reports following FRS 13 and the breakdown of fixed and floating rate debt by currency.

The chapter exploits econometric techniques by employing a selection of tests to analyse the final model for the components, of debt capital by currency denomination and floating rate debt ratio by currency denomination. It starts with OLS and takes into consideration unobservable firm characteristics to reach the most appropriate model, the random effect model. The chapter presents the findings of both foreign and sterling debt for the sample of firms. It gives a general view of the potential determinants of debt mix. The results show that foreign currency derivative is an important factor in determining foreign debt. It also shows that firms rely on foreign operations, as measured by foreign sales and foreign financial assets, with a view to reduce the volatility of exchange rate and cash flow, has an effect on foreign debt.

The chapter, moreover, discusses the composition of floating rate debt ratio by analysing the factors affecting the foreign floating rate debt. It indicates that foreign currency derivative as a key factor. It also shows that the result is consistent with that of debt mix. It demonstrates that firm size, foreign operations (such as foreign sales and foreign financial assets) and credit rating (proxy for source of debt) are positively related to foreign floating rate debt ratio. Finally, we discuss factors determining the domestic floating rate debt as a robustness test.

This chapter proceeds as follows. Section 7.2 shows the descriptive statistics of the potential variables employed in this study. Section 7.3 gives a brief explanation of the expectation of each proxy. The specification of the model and model selection are explained in section 7.4. Section

7.5 discusses the findings of the debt mix, whereas section 7.6 shows the findings of the floating rate debt ratio composition. Finally, the chapter provides some concluding remarks on the results.

7.2: Data sources and descriptive statistics

This chapter uses the same time frame (year 1999-year 2004) for its dataset, which is sourced from annual reports, Datastream and specific sources, as described in Table 26 (column 2). The sample, comprised of only non-financial firms with the highest market capitalisation (*p.141*), consists of a total of 2458 firm-year observations (*p. 141*).

Table 26 Descriptive Statistics

Variables used	Sources	Datastream codes and Formulas	N	Mean	Minimum	Maximum
Cash Ratio	Datastream	(WC02001/WC02999)%	2297	0.1	0	23
Foreign Sales	Annual Reports	(Total sales-UK sales)%	2133	33.55	0	100
Domestic Sales	Annual Reports	(UK sales/Total Sales)%	2133	66.45	0	100
Total Sales(M)	Data stream	(WC01001)	2308	2,242	112.175	1.72E+05
UK floating rate debt	Annual Reports	(UK Floating rate debt/Total debt)%	2084	29.38	0	100
US floating rate debt	Annual Reports	(US Floating rate debt/Total debt)%	1763	14.53	0	100
EU floating rate debt	Annual Reports	(EU Floating rate debt/Total debt)%	1601	7.738	0	100
Foreign Financial Assets	Annual Reports	(Foreign Financial Assets/Total Financial Assets)%	1773	38.19	0	100
Domestic Financial Assets	Annual Reports	(Sterling (UK) Financial Assets/Total Financial Assets)%	1773	61.89	0	100
Interest EU/UK	Datastream	UK T-Bills-Euribor (3 months)	2234	1.63	0.31	2.67
Interest US/UK	Datastream	UK T-Bills-US T-Bills (3 months)	2235	1.37	-0.52	3.44
Credit rating	Standard and Poor's		2458	23.11	0	100
Capital expenditure to sales	Datastream	WC08421	2260	21.7	0	34.727
Foreign Currency Derivatives	Annual Reports	Hand collected	2456	0.53	0	1
Leverage	Datastream	(<i>p.141</i>)	2227	26.4	0	87.96
Foreign Debt	Annual Reports	(1-UK Debt)%	2126	42.07	0	100
Market Capitalisation(M)	Datastream	WC08001	2271	2731	1,125	214,000
Domestic Debt	Annual Reports	(Domestic Debt/ Total Debt)%	1916	57.93	0	100

Table 26 presents the descriptive statistics of the variables utilized in this chapter. It provides the number of observations, mean, minimum and maximum of key firm characteristics. Column 1 shows the main variables employed in the chapter. The next column shows the sources of information and the Datastream codes or formulas employed.

While financial firms can use derivatives to hedge their interest rate risk or foreign exchange rate risk, non-financial firms can utilize some natural hedging techniques. In this study, cash ratio is used as a proxy for natural hedge. Cash ratio is measured as cash holding scaled to total assets (Berospide *et al.*, 2008). The cash ratio mean is 0.1%.

Firms also focus their attention on domestic sales to assess their floating rate debt ratio. It follows that a firm's domestic floating rate debt ratio relies on domestic sales to maximize its earnings. As such, firms with more domestic sales yield more earnings, which results in more domestic floating rate debt. A similar relation is expected when foreign sales (in terms of foreign operations) and foreign floating rate debt is taken into account. Annual reports give a breakdown of domestic sales and foreign sales (proxy for foreign operation). The mean percentage of domestic sales for firms in this sample is 66.45%, while that of foreign sales is 33.55%. This shows that the percentage of domestic sales is twice as much as foreign sales. Hence, it demonstrates that firms have at least one third of foreign operations.

Similarly, annual reports also give a breakdown of debt denominated in different currencies. Debt in this sample is denominated in UK sterling, Euro, US\$ and other foreign currencies. In this chapter, the dependent variables for different models are foreign debt comprises debt other than Domestic debt (sum of all foreign debt). Foreign debt (Total foreign debt/ Total debt) has a mean of 42.07%. The other dependent variables are domestic floating rate debt ratio domestic floating rate debt ratio. Domestic floating rate debt is calculated as domestic floating rate debt

divided by total debt has a mean of 29.38%. This study employs foreign floating rate debt (US floating rate debt and EU floating rate debt) when analysing sterling (domestic) floating rate debt ratio. Firms relying on domestic floating rate debt are less likely to have foreign floating rate debt as firms may find it more difficult to control the latter. More specifically, annual reports give a detailed breakdown of debt that is fixed and floating in different currencies. Table 26 displays the mean of UK floating rate debt at 29%, whereas US floating rate debt is 14.53% and EU floating rate debt is 7.73%.

7.3: Summary of hypotheses

The review of the literature depicts the determinants of the floating rate debt. The studies in Chapter 3 discuss the total floating rate debt mainly, and fail to mention the composition of currency floating rate debt. This chapter explains the composition of foreign debt, domestic debt and the currency composition of floating rate debt.

7.3.1: Foreign operations

As mentioned in Chapter 2 (*p.30*), the two main sources of debt are banks and the public debt market following the asymmetry theory. Firms are more likely to hold floating rate debt when they rely on banks for funding. Bank based debt by definition tends to have short term maturity. Moreover, firms also have access to foreign debt which is sourced from foreign bonds and Eurobonds or foreign institutions. When firms have access to the foreign debt market, we expect them to have foreign operations, which can take the form of foreign sales or foreign financial assets. Firms having foreign debt and foreign operations can match their inflows and outflows as a natural hedge. Thus, a positive relation is expected between foreign debt and foreign operations.

The proxies for foreign operations used in this chapter are foreign sales and foreign financial assets.

7.3.2: Firm size

Chapter 3 (p.82) depicts that larger firms are more likely to have less floating rate debt. Large firms are more likely to lower their risk as they diversify their debt. In an economic downturn, large firms are better expected to withstand any adverse shocks. This could happen, for example, due to their ability to access the bond market, or due to their competitive position in product markets, compared to small firms. This chapter focuses mainly on currency denominated debt. It follows that when large firms have access to foreign debt, and expect a positive relation between large firms and foreign floating debt.

7.3.3: Hedging motives

If investors and issuers have identical expectations regarding the future path of exchange and interest rates, and similar levels of tolerance for risk embodied in unhedged currency exposures, then the use of foreign currency derivative considerations and institutional borrowing costs should be decisive. Although the quantity of bonds issued in a given currency will be determined solely by the capital needs of issuers, firms prefer to alleviate their risks through foreign currency derivatives. As a result, whether firms have foreign debt or foreign floating rate debt, foreign currency derivatives are essential for any firms to manage their risk. As such, we expect a positive sign between foreign debt and foreign currency derivatives.

Moreover, the cash ratio of a firm counts as an important alternative means of derivative. It represents the ultimate hedge, suggesting that derivative via derivatives will be less valuable to

firms with large cash balances. Cash ratio, measured as cash holding to total assets, is employed as a measure of natural hedge in this study.

7.4: Methodology

7.4.1: Model specification

This chapter employs both panel data and pooled regression methods to estimate the following model:

$$Y_{it} = \alpha_0 + \sum_{j=1}^k \beta_j X_{j,it} + \mu_i + e_{it} \quad \text{-Equation 9}$$

Where i stands for the i^{th} cross-sectional unit and t for the t^{th} time period. μ_i stands for the firm specific errors and e_{it} is the general error term.

The dependent variable (Y_{it}) is the ratio of foreign floating rate debt to total debt. The explanatory variables denoted by X_j are as follows:

- Credit Rating
- Foreign currency derivative
- Cash Ratio
- Foreign Sales
- Foreign financial assets
- Firm Size
- Leverage
- $\mu_i + e_{it} = \text{composite error term}$

The composite error term consists of two components u_i and e_{it} (an individual random disturbance which adds to α_0 when this effect is considered as fixed plus the white noise term).

7.4.2: Model selection

This section demonstrates the procedures undertaken to reach the final model. We proceed to the econometric estimation in 2 steps: (1) we run the OLS regressions (in particular, we called it pooled OLS- one intercept and one slope); (2) we briefly discuss the convenience of a fixed effects model versus a random effect specification, as well as a battery of tests intended to help discern which regression is more appropriate. Finally, this chapter shows the econometric results obtained in the best level equation in the next section.

7.4.1.1: Testing for the random effects.

We run the ordinary least squares (OLS) regression. However, OLS do not control for unobserved individual heterogeneity. If such unobservable effects are omitted, OLS estimates would be biased. As a result, the panel data are used to eliminate the effects of omitted variables that are specific to individual cross-sectional units and specific time periods (Hsiao, 1999). We proceed to test whether there are any unobserved effects.

We test the null hypothesis that the cross-sectional variance components are zero and time series variance components are zero by using the Lagrange Multiplier test. Breusch and Pagan (1980) developed the Lagrange Multiplier (LM) test (Green, 2003; and Judge *et al.*, 1988). If the null hypothesis is not rejected, the OLS²² regression model is appropriate; however, if the null hypothesis is rejected, the random effect model is more appropriate. The random effect estimation method treats constant terms as a random variable. In random effect models, firm specific effects are captured as random variables, which are independent of the other regressors. However, this method considers the different firm specific terms as random elements and they

²²The LSDV are also run in this section.

are treated as a part of the error term. Therefore, in a random-effects model the error term has two components: the traditional error unique to each observation and an error term representing the extent to which the intercept of the individual firm differs from the overall intercept.

7.4.1.2: Test for Existence of Random Effects.

If the results of the foregoing test tell us that we should not discard the random effect model, this does not conclude that the fixed effect model should be ruled out. The fixed effect estimation is similar to the random effect estimation as it consists of any unobservable individual effect.

The question is how we compare a fixed effect model and its counterpart random effect model. The Hausman specification test compares the fixed versus random effects under the null hypothesis that the individual effects are uncorrelated with other regressors in the model (Hausman, 1978). If there is no such correlation, then the random effects model may be more powerful and parsimonious. If there is such a correlation (Ho is rejected), the random effects model produces biased estimators, violating one of the GAUSS-Markov²³ assumptions; so a fixed effect model is preferred.

7.4.2: Controlling for potential Endogeneity

The problem of endogeneity occurs when an independent variable is correlated with the error terms in the regression model. This implies that the regression coefficient in any regression is biased. If it is the firm's policy to increase foreign debt, then the foreign currency derivative will

²³ Traditional Gauss – Markov assumptions

- $E(e_{it}) = E(u_i) = 0$
- $E(e_{it}^2) = \delta_e^2$
- $E(U_i^2) = \delta_U^2$
- $E(e_{it} U_j) = 0$ for all i, t and j .
- $E(e_{it} e_{js}) = 0$ if $t \neq s$ or $i \neq j$
- $E(u_i u_j) = 0$ if $i \neq j$

increase simultaneously. This means that firms having more foreign currency derivatives are more likely to have foreign debt. Thus, the models considered will suffer from endogeneity bias as foreign currency derivative is correlated with the error terms in each of their respective regressions. As demonstrated by Berrospide *et al.* (2008), the inclusion of foreign currency derivative could cause an endogeneity problem and, therefore, they employed IV regressions.

7.4.2.1: Test for Endogeneity

It is important to test whether there is any endogenous variable in the model. We use the test which was first proposed by Durbin (1954) and separately by Wu (1973; a T4 statistic) and Hausman (1978). We define the null hypothesis which states that the panel data estimator of the same equation would yield consistent estimates; that is, any endogeneity among the regressors would not have deleterious effect on the estimates. A rejection of the null indicates that endogenous regressor effects on the estimates are meaningful and IV techniques are required.

7.4.2.2: IV estimation

In order to control for the endogeneity problem, an instrumental variable (IV) approach is employed. In this particular case, lagged values of the endogenous variables in the model provide natural candidates (Greene, 2000). Greene (2000) suggests that the best choice of instrument is a variable that correlates highly with the endogenous variable and is uncorrelated with the disturbances. For instance, if foreign floating rate debt is the endogenous variable, then we expect to use lagged floating rate debt as an instrument. The rationale is this year's floating rate debt ratio cannot influence last year's leverage. However, last year's leverage can have an effect on this year's floating rate debt ratio. Similarly, the same rationale is employed to all other

endogenous variables in this chapter. The remainder of this chapter discusses the findings, taking into consideration the entire tests applied in this section to produce the final model selection.

7.5 Debt Mix

Following the analysis of chapter 6 which finds UK non financial firms focus on mainly hedging when choosing total floating rate debt ratio, this section focus mainly on foreign currency derivatives and its effect on foreign debt. We analyse the foreign debt ratio (ratio of total foreign debt to total debt) for our sample of UK non-financial firms. The random effect models are employed together with year dummies to remove any specific variation in foreign debt, and industry dummies to control for variation in operational risk. We note that firms are likely to use foreign currency debt and derivatives in conjunction. Consequently, these two decisions are mutually determined (Berrospede *et al.*, 2008).

We model the foreign debt ratio for all firms in each year as a function of foreign currency derivative usage and some control variables. The control variables are motivated by a broad set of economic arguments. A firm may have natural hedge in the form of foreign currency cash flows that reduce the foreign exchange risk arising from its debt. We, thus, include foreign operations that will allow cash flows. This is measured by foreign sales. Firms also hold financial assets in different foreign currencies. These include the main currencies such as the US dollar, Euro, Australian dollar and Yen. We also include foreign financial assets to control for natural hedge in our sample of firms. Another set of control variables are motivated by the determinant of leverage (Titman and Wessels, 1988; Graham, Lemmon and Schallheim, 1998). We include the effect of firm size proxy by market capitalisation, and asset tangibility which is captured by the ratio of property plant and equipment to total assets.

We provide the regression estimates in Table 27. Model 1 and Model 2 provide both IV regression of random effect with standard errors at firm level. Industry and year fixed effects are included as well. Prior to Table 27, several tests were performed before reaching the final IV regressions. The OLS regressions are run and test whether omitted variables affect the regression. Thus, the Lagrange Multiplier tests are performed. The results show that the value of the chi square test is large and, thus, statistically significant. Therefore, the results of the Breusch Pagan Lagrange Multiplier in Table 27 confirm that the null hypothesis (no omitted variables) is rejected in favour of the random effect model. Moreover, we use the Hausman specification test to compare the fixed versus random effects under the null hypothesis that individual effects are uncorrelated with other regressors in the model (Hausman, 1978). Table 27 also shows the results of the Hausman test. The null hypothesis is not rejected, suggesting that the random effect is more appropriate. It is plausible that the results relating debt mix to foreign currency derivatives suffer from an endogeneity. Firms with high foreign debt are more likely to use foreign currency derivatives and vice versa. In order to address this issue we use instrumental variable regression to estimate the effect of derivatives on foreign debt. We use the lag of foreign currency derivative as an instrument of foreign currency derivative in both models. The lag value is employed as an instrument (Greene, 2000). The lag value is correlated with the endogenous variable but not correlated with the disturbance terms.

Table 27 provides the IV regression estimates of foreign debt mix. We find that the coefficient of foreign currency derivative is positive and statistically significant. This suggests that foreign currency derivative users have higher foreign debt in their liability in both models. Model 1 shows the IV regression of the foreign debt as the dependent variable and foreign currency derivative as the independent variable, and control variables such as firm size as measured by market capitalisation and profitability. The results show that foreign currency derivative and firm

size as measured by market capitalisation are positive and statistically significant. The results demonstrate that firms with higher foreign debt are more likely to hedge their foreign debt. Moreover, firms of a large size are more likely to access foreign debt, which suggest that larger firms have the ability to secure funds not only on a domestic level but at international level as well.

Model 2 displays similar results to Model 1, with positive signs for both foreign currency derivative and firm size. It shows that firms with which are large in size and have foreign currency derivatives have more foreign debt which suggests that when firms are large , they also have a good risk management department which can control for their foreign debt. Compared to Model 1, other control variables are introduced in Model 2. These variables are: the return on capital employed, foreign sales, foreign financial assets and asset tangibility. Return on capital employed is negative and statistically significant at 10%. Another key determinant of foreign debt in Model 2 is foreign operations, which is measured by foreign sales and foreign financial assets. These two variables are positive and statistically significant. Foreign sales and foreign financial assets give an insight that firms have interests in foreign operations, which bring more foreign income to firms. It, thus, acts as a natural hedge strategy, as foreign operations can partially match foreign debt. As a result, foreign operation lowers the foreign currency derivative from 13.65% in Model 1 to 11.49 % in Model 2.

Table 27: Determinants of Foreign Debt: IV Regression for Panel Data Estimation (Random Effect Model)

*The dependent variable is the ratio of foreign debt to total debt of the firm (in %). White heteroscedastic consistent errors, corrected for correlation across observations of a given firm, are reported in parentheses [Rogers (1993) and White (1980)]. All models also include year dummy variables and industry dummy variables. The sample is based on listed non-financial firms for the period between 1999 and 2004. *** indicates statistical significance at 1% level; ** indicates statistical significance at 5% level; * indicates statistical significance at 10% level.*

	Model 1	Model 2
Foreign currency derivative(I*)	0.13635*** (0.0394)	0.1149*** (0.0411)
Market capitalisation	0.0269*** (0.0081)	0.0278** (0.0079)
Return on capital employed	-0.0007 (0.0001)	-0.0002* (0.0001)
Foreign sales		0.0018*** (0.0002)
Foreign financial assets		0.00184** (0.00027)
Asset tangibility		-0.0131 (0.0609)
Year dummy	Yes	Yes
Industry dummy	Yes	Yes
No. of observations	1433	1199
R²	0.20	0.39
Hausman Test	0.112	0.121
Lagrange Multiplier	430.***	470.77***
Wu-Hausman	0.12	0.12

Source: Author

Foreign currency derivative (I*) is the lag value of foreign currency derivative. Foreign currency derivative (I*) is used as an IV regression of foreign currency derivative in the IV regression in Model 1 and Model 2.

7.5.1 Debt Mix (with foreign currency derivatives only)

The previous discussions in Table 27 have noted that foreign currency derivatives include firms that are in fact using other derivatives such as interest rate and commodity price risk. Table 28 moreover, reproduced below the determinants of foreign debt where firms with only foreign currency derivatives are taken into account. To test whether the inclusion of “other derivatives” biases the empirical results against the a priori expectations the models in Table 27 are refitted excluding these “other derivatives” from non foreign currency derivatives group.

In Table 28, interest rate derivatives are excluded and only foreign currency derivatives are taken into consideration. The results of model 1 show that foreign currency derivative is positive and statistically significant at 1%. The result confirms that foreign exchange derivative

is a key determinant to foreign debt. Moreover, model 2 shows that foreign currency derivative is still statistically significant but its coefficient have decreased from 28.53% to 23.23% with the inclusion of foreign sales, foreign financial assets and assets tangibility similar to the results of model 2 in Table 27. It moreover, demonstrates that foreign sales is also a factor determining the foreign debt. Thus, firms having operations in other countries prefer to have debt outside the country of origination just to avoid some foreign currency risk. The exclusion of “other derivative” clearly improves the coefficients of the foreign currency derivatives in Table 28 as compared to Table 27.

Table 28: Determinants of Foreign Debt: IV Regression for Panel Data Estimation with foreign currency derivative only (Random Effect Model).

*The dependent variable is the ratio of foreign debt to total debt of the firm (in %). White heteroscedastic consistent errors, corrected for correlation across observations of a given firm, are reported in parentheses [Rogers (1993) and White (1980)]. All models also include year dummy variables and industry dummy variables. The sample is based on listed non-financial firms for the period between 1999 and 2004. *** indicates statistical significance at 1% level; ** indicates statistical significance at 5% level; * indicates statistical significance at 10% level.*

	Model 1	Model 2
Foreign currency derivative(I*)	0.2853*** (0.0704)	0.2323*** (0.075)
Market capitalisation	0.0098 (0.01835)	0.0083 (0.0184)
Return on capital employed	-0.00002 (0.00003)	0.00001 (0.00003)
Foreign sales		0.0017*** (0.0006)
Foreign financial assets		0.0008 (0.00069)
Asset tangibility		0.0961 (0.133)
Year dummy	Yes	Yes
Industry dummy	Yes	Yes
No. of observations	299	255
R²	0.20	0.32
Hausman Test	0.101	0.112
Lagrange Multiplier	413.***	386.22***
Wu-Hausman	0.11	0.102

Source: Author

Foreign currency derivative (I*) is the lag value of foreign currency derivative. Foreign currency derivative (I*) is used as an IV regression of foreign currency derivative in the IV regression in Model 1 and Model 2.

According to Tables 27 and 28, firms having foreign debt have more foreign currency derivative, whereas firms with domestic debt have the opposite with respect to foreign currency derivative.

This section also shows that foreign operations match foreign debt and partially create a natural hedge strategy. Hence, this decreases the magnitude of the coefficient of foreign currency derivative.

7.5.2: Domestic Debt

Similarly, the study analyses domestic debt ratio (domestic debt to total debt) as the dependent variable, and foreign currency derivative as independent variable and several control variables. This section performs similar statistical tests provided for foreign debt (*p.191*), to show that firms having domestic debt prefer fewer foreign currency derivatives (Berrospide, 2008). The section proceeds by running the OLS and checks for omitted variables. The results of the Breusch Pagan Lagrange Multiplier shows that for both models in Table 29, there are omitted variables since the chi squares are large (653 and 543 for Model 1 and Model 2 respectively) and statistically significant at 1%. Thus, the random effect has a better approximation than the OLS. Having discarded the OLS, we perform the Hausman test to check which model is more appropriate between the random and fixed effects. The results of the Hausman test shows that the fixed effect is discarded and the random effect is accepted for the overall tests.

Table 29 reports both year and industry dummies in the estimation and report White heteroscedasticity consistent errors, corrected for correlation across observations of a given firm, are reported in parentheses (Rogers, 1993; White, 1980). Model 1 in Table 29 shows firms having access to domestic debt are less likely to rely on foreign currency derivatives. This shows that firms are well in control under the current economic environment and do not really need risk management techniques (foreign currency derivative) to alleviate their risk when determining domestic debt. This is because only domestic debt is taken into consideration. Compared to Model 1 in Table 27 and 28 which concentrates on foreign debt, Model 1 in Table 29 shows a

negative relationship between market capitalisation and domestic debt. This result is consistent with Berrospide *et al.* (2008). It suggests that firms with larger size are more likely to access foreign debt than domestic debt. In addition to Model 1 in Table 29, Model 2 shows two variables which are negatively related to the domestic debt. The foreign currency derivative and firm size are statistically significant. Moreover, domestic financial asset is positively related and statistically significant to domestic debt. It shows that firms having domestic financial assets tend to match domestic debt as a natural hedge strategy. In such a situation, firms have less risk and, hence, less foreign currency derivative. When domestic financial asset is included in Model 2, it demonstrates that foreign currency derivative decreases from 15.6 % (Model 1) to 16.17 % (Model 2).

Table 29: Determinants of Domestic Debt: IV Regression for Panel Data Estimation (Random Effect Model)

*The dependent variable is the ratio of domestic (sterling) debt to total debt of the firm (in %). White heteroscedastic consistent errors, corrected for correlation across observations of a given firm, are reported in parentheses [Rogers (1993) and White (1980)]. All models also include year dummy variables and industry dummy variables. The sample is based on listed non-financial firms for the period between 1999 and 2004. *** indicates statistical significance at 1% level; ** indicates statistical significance at 5% level; * indicates statistical significance at 10% level.*

	Model 1	Model 2
Foreign currency derivative(I*	-0.156*** (0.0559)	-0.1617*** (0.0593)
Market capitalisation	-0.0305*** (0.0083)	-0.0283*** (0.0084)
Return on capital employed	0.04992 (0.03160)	0.01701 (0.0326)
UK financial assets		0.00218*** (0.00027)
Year dummy	Yes	Yes
Industry dummy	Yes	Yes
No. of observations	1422	1188
R²	0.17	0.31
Hausman Test	0.13	0.14
Lagrange Multiplier	653**	543***
Wu-Hausman	0.11	0.12

Source: Author

Foreign currency derivative (I*) is the lag value of foreign currency derivative. Foreign currency derivative (I*) is used as an IV regression of foreign currency derivative in the IV regression in model 1 and model 2.

Table 30 shows the same variables as in Table 31 but with sample of firms that excludes interest rate derivatives that is, firms that are using foreign currency derivatives only. The results confirm that firms which are using domestic debt are less likely to use foreign currency derivatives to hedge their risk. Model 2 in Table 30 also shows that foreign currency derivatives are negatively related to the foreign debt. This result is consistent with Berrospide *et al.* (2008).

Table 30: Determinants of Domestic Debt: IV Regression for Panel Data Estimation with foreign currency derivative only (Random Effect Model)

*The dependent variable is the ratio of domestic (sterling) debt to total debt of the firm (in %). White heteroscedastic consistent errors, corrected for correlation across observations of a given firm, is reported in parentheses [Rogers (1993) and White (1980)]. All models also include year dummy variables and industry dummy variables. The sample is based on listed non-financial firms for the period between 1999 and 2004. *** indicates statistical significance at 1% level; ** indicates statistical significance at 5% level; * indicates statistical significance at 10% level.*

	Model 1	Model 2
Foreign currency derivative(I*)	-0.2827*** (0.0712)	-0.2511*** (0.0756)
Market capitalization	-0.0128 (0.0186)	-0.01685 (0.0084)
Return on capital employed	0.0682 (0.0739)	0.0179 (0.0751)
UK financial assets		0.00095 (0.00069)
Year dummy	Yes	Yes
Industry dummy	Yes	Yes
No. of observations	298	254
R²	0.20	0.25
Hausman Test	0.11	0.16
Lagrange Multiplier	569**	531***

Source: Author

Foreign currency derivative (I*) is the lag value of foreign currency derivative. Foreign currency derivative (I*) is used as an IV regression of foreign currency derivative in the IV regression in model 1 and model 2.

As a robustness test, this section find out that firms with domestic debts are less likely to employ foreign currency derivatives as their debts are mostly sources locally. Therefore, foreign currency derivative is not an important factor for domestic debts as compared to foreign debts.

7.6: Composition of floating rate debt ratio

7.6.1: Foreign floating rate debt ratio.

The previous section focuses on the debt mix comprising foreign and domestic debt. Both foreign and domestic debt comprises the sum of fixed and floating rate debt. This section considers mainly the proportion of floating rate debt by currency. The foreign floating rate debt ratio (foreign floating rate debt total debt) and sterling floating rate debt ratio (UK floating rate debt to total debt) will be utilized as the dependent variable in Tables 31 and 32 respectively.

This section proceeds with the econometric estimation by performing the OLS, random effect model and fixed effect model. We run the three regressions and present their tests. The first regression run is the OLS. We test whether there are omitted variables in the regressions. Thus, the Breusch-Pagan Lagrange Multiplier test is utilized. The results in Tables 31 and 32 show the chi square tests have a large value and are statistically significant. The Breusch Pagan Lagrange Multiplier, thus, deduces that the OLS is inefficient. Once OLS estimates are discarded as a result of their relative inefficiency, we decide which estimator between the random effect model and the fixed effect model yields the most reliable and robust results. We utilize the Hausman test in Table 31 and Table 32, which both show that fixed effect is discarded to the random effect.

It is probable that the results relating to foreign floating rate debt ratio and foreign currency derivatives suffer from the endogeneity problem. The same problem applies to foreign floating rate debt and leverage. Firms with high foreign floating rate debt are more likely to use foreign currency derivatives and leverage. Firms with foreign currency derivatives and leverage are more likely to have foreign floating rate debt. To address this issue, we use instrumental variable regression to estimate the effect of derivatives and leverage on foreign floating rate debt. We use the lag of foreign currency derivative and lag of leverage as instruments of foreign currency derivatives and leverage respectively in all models in Table 31. The lag value (foreign currency

derivatives and leverage) is employed as an instrument as it is correlated with the endogenous variable but not correlated with the disturbance terms (Greene, 2000).

Table 31 shows the IV regression with the foreign floating rate debt ratio as the dependent variable. The models show that firms having foreign floating rate debt ratio not only hedge their foreign floating rate debt but also use external sources of finance and have foreign operations. White heteroscedastic consistent errors, corrected for correlation across the observations of a given firm, are reported in parentheses (Rogers, 1993; White, 1980). All models also include year dummy and industry dummy variables. Table 31 shows the main components of the IV regression are statistically significant. Foreign currency derivatives, credit ratings, foreign sales foreign financial assets and leverage are positively related to foreign floating rate debt ratio.

The previous section shows that firms having foreign debt are more likely to have foreign currency derivatives. Similarly, firms having foreign floating rate debt find themselves in a riskier situation and we expect firms to have more foreign currency derivatives. As a result, the coefficient of the estimate of foreign currency derivatives is positive as expected. This is because firms having foreign floating rate debt are more prone to any types of risk of failure coupled with foreign exchange rate risk and high levels of debt.

The source of debt is an important factor when analysing debt. When firms have access to capital markets, we expect firms to have less total floating rate debt ratio. However, when firms have foreign floating rate debt ratio, they consider more access to capital markets to minimise the exchange rate. Hence, we expect firms having access to capital and foreign markets to have foreign floating rate debt since they have operations overseas. Model 1 shows that credit rating, a proxy for firms' access to capital markets, has a positive sign and is statistically significant. This

is due to the fact that firms located in the UK who have a good credit rating are better off when considering foreign floating rate debt as they are more exposed to international debt where they have operations. This result in Model 1 gives an insight that firms having access to international markets have more foreign floating rate debt.

Foreign sales and foreign financial assets have the sign expected and are highly significant at 1% and 5% respectively. This is consistent with the hypothesis that firms raise foreign floating rate debt when they have access to foreign operations, which, in terms of foreign sales and foreign financial assets, can partially hedge their foreign currency exposure. The economic rationale is that firms can reduce their foreign currency exposure by matching the foreign floating rate debt to foreign financial assets by having foreign operations.

Model 2 has all the variables of Model 1 but with additional independent variables. It shows that foreign currency derivative, credit rating, foreign sales, foreign financial assets, leverage, cash ratio, total sales and the interaction between foreign sales and credit rating are statistically significant. Model 2 shows that firm size and cash ratio are key variables for foreign floating rate debt ratio. It demonstrates that log of total sales, a proxy for firm size, is positive and statistically significant. It demonstrates that large firms normally lower their risk by diversifying their debt in overseas. When large firms have foreign operations, such as foreign sales and foreign financial assets, foreign floating rate debt is expected. This is due to the fact that foreign operations can match the foreign debt. Moreover, cash ratio is also positive and significant. Since the cash ratio and foreign operations act as a natural hedge, the foreign currency derivative decreased from 7.36% in Model 1 to 5.4% in Model 2. Model 2 also displays that firms having more foreign currency derivative are more likely to have more foreign floating rate debt ratio. This indicates that foreign currency derivative can recover the risk of the floating rate debt ratio. The credit

quality is also an important factor when considering foreign floating rate debt ratio. It demonstrates that firms having a good credit quality as measured by credit rating have more foreign floating rate debt ratio as these firms can access to foreign market and can face the any fluctuation in interest rates since they have foreign operations.

Table 31: Determinants of Foreign Floating Rate Debt: IV Regression for Panel Data Estimation (Random Effect model)

The dependent variable is the ratio of foreign floating rate debt to total debt of the firm (in %). Model 1 and 2 show the entire sample of firms whereas model 3 and model 4 display firms with floating rate debt ratio higher than the median. White heteroscedastic consistent errors, corrected for correlation across observations of a given firm, are reported in parentheses [Rogers (1993) and White (1980)]. All models also include year dummy variables and industry dummy variables. The sample is based on listed non-financial firms for the period between 1999 and 2004. *** indicates statistical significance at 1% level; ** indicates statistical significance at 5% level; * indicates statistical significance at 10% level.

	Model 1	Model 2	Model 3	Model 4
Foreign currency derivative(I*)	0.07368** (0.029252)	0.05412* (0.0291)	0.1864*** (0.0548)	0.1660*** (0.0541)
Cash Ratio		0.01414** (0.0068)		0.006 (0.0116)
Credit Rating	0.05992** (0.0242)	0.4421* (0.2331)	0.0196 (0.0518)	0.7162 (0.4455)
Total Sales(log)		0.0203** (0.0090)		0.0415** (0.01902)
Total Sales*Credit Rating		-0.0282* (0.0161)		-0.0519* (0.0310)
Foreign Sales	0.00084*** (0.0002)	0.00150*** (0.00026)	0.00173*** (0.0005)	0.00206*** (0.00048)
Foreign Financial Assets	0.0007** (0.00027)	0.0007*** (0.00027)	0.0011** (0.00047)	0.0013*** (0.00047)
Leverage (I*)	0.14428* (0.0833)	0.1712** (0.0743)	0.2997* (0.1668)	0.1704 (0.1618)
Year Dummy	Yes	Yes	Yes	Yes
Industry Dummy	Yes	Yes	Yes	Yes
No. of observations	1205	1133	443	429
R²	0.16	0.18	0.31	0.18
Hausman Test	0.21	0.19	0.22	0.20
Lagrange Multiplier	542.5***	507.85***	527.5***	517.64***
Wu-Hausman	0.12	0.12	0.13	0.14

Source: Author

Foreign currency derivative (I*) is the lag value of foreign currency derivative. Foreign currency derivative (I*) is used as an instrument of foreign currency derivative in the IV regression in Model 1 and Model 2.

Leverage (I*) is the lag value of leverage. Leverage (I*) is used as an IV regression of leverage in the IV regression in Model 1 and Model 2.

Models 3 and 4 display the results of firms having a high level of floating rate debt. Only firms having floating rate debt higher than the median are considered. The rationale for considering firms with the highest level of floating rate debt is that firms are more prone to risks. The results of Model 3 show that the coefficient of the foreign currency derivative is 18.64% and statistically significant at one percent. It demonstrates that high risk firms are more likely to have more foreign currency derivative so that they can avoid any fluctuations in foreign currency.

Moreover, foreign sales, foreign financial assets and leverage have positive signs and are statistically significant. When the sample is trimmed from Model 1 to Model 3, it can be deduced that firms are more prudent when considering high levels of floating rate debt by concentrating more on foreign sales and foreign financial assets as the coefficients have increased from model 1 to model 3. It informs the author that firms concentrating more on foreign sales and foreign financial assets are likely to have foreign floating rate debt due to the high percentage of foreign operations. Model 4 has the same characteristics of Model 2 but takes firms with only high percentages of floating rate debt ratio into consideration. Model 4 shows that foreign currency derivative has a positive coefficient, and is highly significant. It can be analysed that there is an increase in the coefficient as these firms are risky as compared to Model 2. The other point to note is the coefficient of the foreign currency derivative decrease in Model 3 as compared to Model 4, as firms employ foreign financial assets and foreign sales. The foreign sales and foreign financial assets are positively related to foreign floating rate debt ratio and act as a natural hedge reduce the coefficient of foreign currency derivative in Model 4. It also shows that firm size (proxy by logarithm of total sales) is positively related to floating rate debt showing that firms which are large in size can diversify their debts.

7.6.2: Domestic floating rate debt ratio.

This section takes into account the domestic floating rate debt as a robustness check for foreign floating rate debt. Table 32 displays the IV regressions of the domestic floating rate debt as the dependent variable and the control variables. It shows that foreign currency derivative is a key element when firms have domestic floating rate debt.

Model 1, in Table 32, shows that firm size is negatively related to sterling floating rate debt. It suggests that large firms with a large amount of debt prefer fixed rate debt to avoid any

fluctuation in earnings. Moreover, it also demonstrates that firms can also access to foreign debt than domestic debt. Moreover, domestic financial asset is positively related to domestic floating rate debt and is statistically significant at 1%. Domestic financial assets, such as securities or bank balance or deposits, can match the financial liabilities of firms, thus, acting as a natural hedge. Table 32 finds that the estimation of financial assets is positive as expected showing that it can cover any their domestic floating rate debt. Table 32 also finds that foreign floating rate debt (US floating rate debt and EU floating rate debt) and leverage have a negative sign and are statistically significant. Both leverage and foreign floating rate debt are lagged and instrumented in the IV regression. Moreover, this study control for interest rate parity for EURO and US and found that the interest rate parity for EU is positive and negative for US as compared to the domestic floating rate debt.

Model 2 in Table 32 have the same variables as model 1 except the yield spread. The inclusion of the yield spread did not have any impact on Model 2 as all the variables have similar results to Model 1. Credit rating, Total sales, Leverage, EU floating rate debt, US floating rate debt, and the Difference between US and UK are negative related to domestic floating rate debt. Whereas domestic financial asset is positively related to domestic floating rate debt.

Table 32: Determinants of Domestic Floating Rate Debt: IV Regression for Panel Data Estimation (Random Effect Model)

The dependent variable is the ratio of domestic (Sterling) floating rate debt to total debt of the firm (in %). White heteroscedastic consistent errors, corrected for correlation across observations of a given firm, are reported in parentheses [Rogers (1993) and White (1980)]. All models also include year dummy variables and industry dummy variables. The sample is based on listed non-financial firms for the period between 1999 and 2004. *** indicates statistical significance at 1% level; ** indicates statistical significance at 5% level; * indicates statistical significance at 10% level.

	Model 1	Model 2
Foreign currency derivative(I*)	0.073* (0.0425)	0.0777* (0.0418)
Credit Rating	-0.2137 (0.2857)	-0.2037* (0.2827)
Total Sales	-0.0232** (0.0107)	-0.0296*** (0.0113)
Total Sales*Credit Rating	0.0143 (0.0198)	0.0165 (0.0196)
Yield Spread		-0.0147 (0.0196)
Domestic Financial Assets	0.0009*** (0.0002)	0.0010*** (0.0003)
Leverage (I*)	-0.2548** (0.1166)	-0.2604** (0.0743)
EU Floating Rate Debt(I*)	-0.0024*** (0.0005)	-0.0024*** (0.0006)
US Floating Rate Debt(I*)	-0.0033*** (0.00045)	-0.0034*** (0.0004)
Difference EU and UK	0.0506** (0.0243)	0.0481* (0.0253)
Difference US and UK	-0.0454* (0.0260)	-0.0569* (0.0336)
Year Dummy	Yes	Yes
Industry Dummy	Yes	Yes
No. of observations	884	877
R²	0.23	0.24
Hausman Test	0.18	0.17
Lagrange Multiplier	234***	258***
Wu-Hausman	0.13	0.12

Source: Author

Foreign currency derivative (I*) is the lag value of foreign currency derivative. Foreign currency derivative (I*) is used as an instrument of the foreign currency derivative in the IV regression in Model 1 and Model 2.

EU floating rate debt (I*) is the lag value of EU floating rate debt. EU floating rate debt (I*) is used as an instrument of EU floating rate debt in the IV regression in Model 1 and Model 2.

US floating rate debt (I*) is the lag value of US floating rate debt. US floating rate debt (I*) is used as an instrument of US floating rate debt in the IV regression in Model 1 and Model 2.

Leverage (I*) is the lag value of leverage. Leverage (I*) is used as an instrument of leverage in the IV regression in Model 1 and Model 2.

7.6: Conclusion

This chapter examines the composition of the determinants of the floating rate debt mix of UK non-financial firms for the period 1999-2004. The descriptive statistics and two different sections are discussed. The first section presents the debt mix, and the second presents the composition of the floating rate debt that is foreign floating rate debt and domestic floating rate debt.

This chapter begins by discussing the descriptive statistics and discusses the methods to analyse the composition of floating rate debt ratio. An interesting finding is the positive relationship between the foreign currency derivatives and foreign debt when the debt mix is considered. It also shows that firm size is a determinant of foreign debt ratio. The results in Table 28 also demonstrate that return on capital employed is negatively related to foreign debt, whereas foreign operations as measured by foreign sales and foreign financial assets are positively related to foreign debt. This is consistent with Berrospide *et al.* (2008). It shows that firms have some foreign operations to match the differentials in exchange rates and are also prepared to alleviate their risk by employing foreign currency derivatives. Therefore, foreign currency derivative is an important element that helps firms to access foreign debt by alleviating their currency risk of foreign debt.

Moreover, as a robustness test, domestic debt is analysed. In contrast to foreign debt, firms having domestic debt are less likely to employ derivatives as they operate locally. The results show that foreign currency derivatives and firm size are negatively related to domestic debt. Moreover, domestic financial asset is positively related and statistically significant to domestic debt. It shows that firms having domestic financial assets tend to match domestic debt as a natural hedge strategy. In such a situation, firms have less risk and, hence, less foreign currency derivative. According to Table 28, firms having foreign debt have more foreign currency

derivatives, whereas firms with domestic debt have the opposite sign with respect to foreign currency derivatives. Moreover, when firms have a natural hedge in terms of operations or financial assets, the magnitude of foreign currency derivatives tends to decrease.

This chapter follows a discussion of the major factors affecting foreign floating rate debt. Firms having foreign floating rate debt find themselves in riskier situations and expect to have more foreign currency derivatives. The estimate of foreign currency derivatives is positive as expected. It also demonstrates that sources of debt and foreign operations such as foreign sales and foreign financial assets are important factors when analysing foreign floating rate debt. The variable foreign sales and foreign financial assets are positively related to the foreign floating rate debt. This is consistent with the hypothesis that firms raising foreign floating rate debt have access to foreign operations in terms of foreign sales and can partially hedge their foreign exposure. Moreover, firms can reduce their foreign currency exposure by matching the foreign floating rate debt with foreign financial assets. The results also find that firm size and cash ratio are key variables for foreign floating rate debt ratio. Since cash ratio is positive and significant, foreign currency derivatives decrease from 7.36% in Model 1 to 5.4% in Model 2, as cash ratio acts as a natural hedge.

The final part of the chapter shows that foreign currency derivative is still a key element when analysing domestic floating rate debt. Foreign floating rate, firm size, credit rating and leverage are negatively related to domestic floating rate debt.

The main findings of this chapter show that although firms are borrowing their debts locally or outside UK, firms take into account the risk factor. As demonstrated in chapter 6, firms prefer to hedge instead of timing the market and with a more detailed analysis of foreign debt and foreign

floating rate debt, firms control their risk by both foreign currency derivatives and foreign operations as a natural hedge.

Chapter 8: Conclusion

8.1: Introduction

This chapter summarises the results of this research. Section 8.2 examines the research questions and the review of the main literature of the thesis, as well as the main rationales for researching the choice of fixed and floating rate debt. Section 8.3 reviews the origination of data and the database. Section 8.4 reviews the empirical results of the three main empirical chapters of the fixed and floating rate debt. Section 8.5 concludes the results of the thesis and Section 8.6 focus on areas of further research.

8.2 Summary of the research questions and the empirical review of the thesis.

This research project studies the choice of fixed and floating rate debt within corporate finance programs. The decision to choose between fixed and floating rate debt undertaken at the firm level has attained great attention in recent decades by non-financial corporations. This growing attention has been mainly stimulated by the disclosure of the FRS 13, which was enacted in 1998. Since 1999, listed firms are required to disclose their financial instruments in their annual reports.

The purpose of this study was to investigate the determinants of the choice of fixed and floating rate debt mix of non-financial firms in the UK for the period from 1999 to 2004. Only firms with the highest market capitalisation from the FTSE are accounted for in this study. It should be noted that firms with market capitalisation of less than £1000m are not considered as the largest firms. Moreover, this study excludes financial firms, as they already have a risk

management process to hedge their interest rate and exchange rate risk. The study sourced all firms' characteristics from annual reports, Datastream, and Standard and Poor's. It defines all the variables employed in this study. The results show that more than 70% of the number of non-financial firms have sterling debt for each of the years from 1999-2004 and the percentage of sterling debt is more than 40% for the same period of time.

To give an example, the treasurer of a manufacturing company will advise choosing floating rate debt when interest rate will decrease, otherwise a firm will use fixed rate debt. A firm can also have plant and machinery, or foreign debt if they were to control for foreign currency risk, and foreign floating rate debt to control for different exposures such as foreign currency derivatives. In this thesis, we focus on the total floating rate debt ratio and the foreign floating rate debt. In this context, we define floating rate debt by dividing outstanding debt by total debt. We control for the use of derivatives and firms' characteristics. In our analysis, especially in the main empirical Chapters 5, 6 and 7 is a key to explain a rational motive for floating rate debt ratio.

In Chapter 1, we formulate the main goal of this thesis as follows:

The main goal of this thesis is to extend the existing literature of capital structure to provide a better understanding of the main reasons on that which financial managers focus when the decision on taking floating rate debt arise for UK non-financial firms.

Based on this main goal, four research questions are formulated, and answered in Chapters 5, 6 and 7.

1. What are the main determinants of the fixed and floating rate debt mix?
2. Are firms really timing the market, or hedging in determining the floating rate debt?

-
3. How does the composition of currency affect the floating rate debt ratio?
 4. Does the credit rating have an effect on the percentage of fixed and floating rate debt ratio?

In the remainder of this chapter, we summarize the preceding chapters, mention the main contributions to existing literature and, finally, suggest some possible extensions to our analysis in future research.

Chapter 2 provides the theoretical foundation for this study in the first section. It shows the conditions for the irrelevance of a firm's capital structure following Modigliani and Miller (1958). It also discusses the theories of capital structure and explains the fixed and floating rate debt structure in conjunction with the theories of capital structure. The second part of Chapter 2 generates the hypothesis of the fixed and floating rate debt and presents an overview of the main factors determining the floating rate debt ratio. These include: natural hedging, hedging, market timing, sources of debt, profitability, financial distress, debt to maturity and firm size.

In Chapter 3 we extend the theories in Chapter 2 and exploit the empirical literature of the fixed and floating rate debt. Faulkender (2005) examines the interest rate exposure for firms in the chemical industry and finds: i) firms choose fixed rate exposure when economic conditions are expected to worsen; ii) firms engage in market timing through the use of derivatives but do not hedge cash-flows; and iii) the slope of the yield curve at the time of debt issue determines whether firms use interest rate swaps to alter the interest rate exposure of their debt. Similarly, Vickery (2008) studies the interest rate exposure choices of small firms and finds evidence suggesting that high real interest rates and a steep yield curve are correlated with a lower proportion of fixed debt.

Other empirical studies have examined the floating rate share of a firm's liability structure. Chava and Purnanandam (2007) study how managerial incentives affect the ratio of floating rate debt and report that smaller firms with more valuable growth options that are closer to financial distress adopt a conservative debt financing strategy by maintaining lower levels of floating-rate debt. This is in line with findings reported by Vickery (2008). By contrast, Covitz and Sharpe (2005) find that smaller, lower-rated firms tend to have greater initial interest rate exposures on their total liabilities compared with larger firms.

8.3: Review of the origination of data.

The central part of this research is the type of data which are utilised. Chapter 4 explains the data selection process and examines the characteristics of the firms included in this research. The sample database of this study comprises UK non-financial firms for the period 1999 to 2004. It starts with 1999 following the disclosure requirements of the FRS 13. The data originates from different sources such as hand collected information from annual reports and databases. Annual report data contain specific information on fixed debt, floating debt, foreign debt and debt in different currencies. Data originating from databases are mainly from Datastream, which contains firm-specific information. This study chose to restrict only outstanding debt issued by non-financial firms, thus excluding the financial sector. Financial intermediaries differ significantly in their business and financial structure from industrial firms and are therefore commonly studied in isolation. Focusing this study on industrial firms allows for better comparison with earlier empirical literature, which has almost exclusively considered only non-financial firms.

The number of firms in the sample from 1999-2004 varies from one year to another. The main reasons for the variations in the number of firms in different years are due to mergers, acquisitions, takeovers, or companies who are no longer listed in the Financial Time Stock Exchange at the end of each financial year.

Chapter 4, moreover, defines the main variables used in this study followed by the descriptive statistics of the number of firms holding financial liabilities and the value of the financial liabilities by currency. It also shows the interest rate profile of financial liabilities where the floating rate debt ratio appears to be more than 52% for all years which indicates that UK non-financial firms prefer floating rate debt to fixed rate debt.

8.4: Empirical Analysis

Each of the empirical chapters (Chapter 5, 6 and 7) seeks to answer the research questions and, consequently, utilises more or less the same sample of the entire data set. Tables 14, 20 and 27 highlight the various variables included in the empirical Chapters 5, 6 and 7, respectively. The three tables present additional statistical properties for the data. The most obvious difference in the samples is the variables considered in each of the empirical chapters. The key element under investigation that drives the three empirical chapters is the effect of rated firms on floating rate debt ratio, the percentage of the floating rate debt and the composition of floating rate debt and. This study includes outstanding debt of both fixed and floating.

Determinants of Capital Structure and debt structure (Fixed and Floating Debt): new empirical evidence from UK non-financial firms

This chapter shows the determinants of the capital structure and debt structure (fixed and floating rate debt) of the capital structure and the credit quality. It shows that the variation of fixed and floating rate debt can have an impact on capital structure, as focusing on only floating

rate debt can be risky for a firm. It demonstrates whether there is any heterogeneity in the types of debt in capital structure by employing a comprehensive dataset for UK non-financial firms. This chapter follows the studies of Rajan and Zingales (1995), Rauh and Sufi (2008) and Lemmon, Roberts and Zender (2008) by focussing on the variations on the two types of debt.

In a capital structure context, this chapter finds consistent results following Rajan and Zingales (1995) and Lemmon, Roberts and Zender (2008). It shows that UK non-financial firms which are profitable and with high market to book value have less debt, whereas firms with high asset tangibility and market capitalisation prefer more debt. The results in Table 15, where the fixed and floating rate debt are considered separately, demonstrate that floating rate debts are largely driven by market to book value. It shows, moreover, that fixed debts are driven by asset tangibility and market to book value.

When considering the robustness tests for the heterogeneity of the fixed and floating rate debt in the capital structure, the credit quality is considered; that is, firms with bank based debt are considered as non rated firms, and rated firms are considered non bank based debt. Firms move from bank based debt to non bank based debt as the credit quality improves (Diamond, 1991). The results show that rated firms are more likely to focus on fixed rate debt as expected, and non rated firms have more floating rate debt. This is illustrated by both bar chart and regression analysis.

Chapter 5, moreover, applies changes in the floating rate debt as a robustness test to analyse whether there are any inconsistencies with respect to the heterogeneity of fixed and floating rate debt in the capital structure. Consistent with traditional theories, profitability and debt are negatively related. It also shows that there is a positive relationship between asset tangibility

and debt, which is consistent with Rajan and Zingales (1995), and Lemmon, Roberts and Zender (2008).

The determinants of floating rate debt ratio: new evidence from UK non-financial firms.

Chapter 6 empirically examines the determinants of floating rate debt ratio of UK non-financial firms. The main objective of this chapter is to provide new evidence on the determinants of UK non-financial firms. Although other studies (Rokkannen, 2007; Faulkender, 2006; Vickery, 2008; and Faulkender and Chernenko, 2007) focus on the issue of debt, this study is the first of its kind to focus on outstanding debt in the UK context. Chapter 6, thus, presents the findings of the total floating rate debt ratio by running the OLS and tests for Lagrange Multiplier followed by the Hausman test. The final model is the random effect model which is considered. The chapter also controls for any endogeneity problem and employs the IV regressions to analyse the total floating rate debt ratio. The first section of the empirical analysis shows that floating rate debt of non-financial firms is positively related to natural hedging, and negatively related to interest rate swaps. This shows that UK non-financial firms prefer hedging to market timing in deciding their floating rate debt ratio. The robustness test, moreover, confirms that firms are more likely to focus on hedging. In addition to hedging, as presented in Table 21, firms accessing the capital markets as measured by credit rating are less likely to have floating rate debt. It also shows that debt to maturity is an important factor affecting the floating rate debt ratio. It follows that firms close to financial distress which are large in size are less likely to consider floating rate debt to avoid any fluctuation in interest rates.

In order to test the robustness of a firm's preferences for hedging to the yield curve, Chapter 6 separates firms employing interest rate swaps and firms without interest rate swaps. The results in Table 23 confirm that even if firms are not using interest rate swaps as a measure of

derivative, firms use other measures of hedging such as natural hedging (ratio of financial assets to financial liabilities) in deciding the floating rate debt.

Chapter 6 also demonstrates that smaller firms in the sample are also naturally hedging their exposure in deciding on the floating rate debt ratio. In addition, a change in the floating rate debt ratio yields similar results; that is, non-financial firms are hedging instead of timing the market.

The determinants of the composition of floating rate debt ratio: new evidence from UK non financial firms.

The previous results show that firms are mainly hedging instead of timing the market when deciding on floating rate debt ratio. In the same line of research, Chapter 7 reviews the currency composition of floating rate debt for non-financial firms in the UK. It reviews whether UK non-financial firms have operations locally and overseas and their effect on the foreign debt and foreign floating rate debt ratio.

Chapter 7 follows the same methods of analysis as in the previous chapter. It uses the Lagrange Multiplier test, Hausman tests and, finally, tests for endogeneity. It analyses the debt mix for the sample of non-financial firms. The results show that firms having foreign debt are more likely to hedge their foreign exchange risk by utilising foreign currency derivatives and these firms have a high market capitalisation. The analyses, moreover, demonstrate that when firms have foreign sales and foreign financial assets, the coefficient of foreign currency derivatives decreases. This means that firms do not need to fully manage their foreign debt when firms have foreign operations or foreign sales. Chapter 7 also shows the robustness test for firms having only foreign currency derivatives, which means other derivatives such as interest rates and commodities are excluded from the sample. The results confirm that the foreign currency derivative is still an important element when considering debt mix.

Chapter 7 also focuses on domestic debt as a robustness test for debt mix. The results demonstrate that firms concentrating on domestic debts are less likely to have foreign currency derivatives. The inclusion of domestic financial assets shows that there is a decrease in the foreign currency derivative. The results confirm that firms having domestic debt together with domestic financial assets are less likely to have foreign currency risk.

In addition, Chapter 7 analyses the debt mix in depth by investigating the foreign floating rate debt ratio. The results demonstrate some similarities. It demonstrates that firms with more foreign currency derivatives, credit rating, and foreign sales have more foreign floating rate debt. In addition, it also finds that the inclusion of cash ratio, which can be a source of natural hedging, thereby decreases the foreign currency derivatives. When only the highest percentage of foreign floating rate debt is taken in consideration as a robustness test, the results for foreign currency derivatives are still significant. The results are consistent with the total sample where foreign currency derivatives, foreign sales, foreign financial assets are factors which affect the foreign floating rate debt ratio.

8.5: Conclusion and contribution

This thesis examines the determinants of the floating rate debt, having departed from a popular branch of research focusing on capital structure. The approach in this study has allowed the researcher to examine a far wider spectrum of outstanding debt over a longer period of time post FRS 13 in the year 1999. Previous studies involving floating rate debt and derivatives have been significantly restricted in terms of the length of time period, and other previous studies mainly concentrated in the US. Naturally, firms can fund their activities from fixed rate debt and floating debt or both. In line with fixed and floating rate debt, bond issuers do not only fund themselves from the capital market that is with fixed rate debt, they can also have bank based debt. The aim is to understand the general determinants of debt type and the drivers affecting the overall choice of debt.

The overall contribution of this study to the existing empirical literature is to provide new evidence from the economic point of view of the capital structure and the relationship between floating rate debt ratio and the key determinants of floating rate debt. The thesis focuses on the heterogeneity of debt in the capital structure and the source of debt. It takes into consideration the fixed and floating rate debt and credit rating. The main contribution the thesis find out that there is heterogeneity in determining the capital structure when consideration the fixed and floating rate debt. The contribution of chapter 5 shows that the determinants of capital structure vary when the author considers the fixed and floating rate debt. The proxies for profitability and market to book value are negatively related to the capital structure and assets tangibility and firm size are positively related to capital structure. These results are similar to Rajan and Zingales (1995). The contributing factor is that asset tangibility is contributing not only to capital structure but to fixed and floating rate debt. It also shows that firm size is negatively related to floating rate debt ratio as compared to capital structure. The negative coefficient

demonstrates that firms having higher market capitalisation are more likely to borrow from the capital market than banks. Another contributing factor is that growth firms are negatively related to the capital structure as well as the fixed and floating rate debt ratio.

The other contribution from this dataset of UK firms is that non financial firms are mainly hedging instead of market timing. Compared to the existing empirical literature on the topic, this thesis extends in several important dimensions in terms of scope and methodology. This study is the first to investigate the relationship between floating rate debt by using a comprehensive dataset for UK non-financial firms. Since 1999, following the FRS 13, an understanding of the floating rate debt by different countries was analysed but little research was done in the UK. Thus, an understanding of the determinants of floating rate debt for UK non-financial firms is important for financial managers where specific decisions can be made. The new empirical evidence provided by this research fills an important gap in the existing literature.

In studying outstanding debt in the UK non-financial firms after the introduction of the FRS 13, together with the “inauguration of common currency the EURO”, the researcher finds evidence of firms relying mainly on hedging in deciding their floating rate debt as a contributing factor, which is contrary to Graham and Harvey (2001) and the empirical work by Faulkender (2005) and Vickery (2008) who find that firms are timing the market in determining the floating rate debt. Derivatives or natural hedging is considered as a reliable indicator for floating rate debt and this appears to be significant in Chapter 6. The contribution to the thesis is that ratio of financial assets to financial liabilities which is a key proxy for the natural hedge is a determining factor for the floating rate debt ratio. This finding is consistent through various robustness checks on the full sample. The researcher also postulates that the financial manager will prefer fixed rate debt which is driven by a low interest rate environment; a result which

aligns well with predictions by Longstaff and Schwartz (1995) who argue that fixed rate debt is preferred when interest rates are below long-term averages.

The results also show that the maturity of debt has the predictive power for the outstanding type of debt in the total sample of firms. The potential endogeneity problems are dealt with and the instrumental variable regression is employed. Long-term debt tends to be issued with fixed coupon payments, while average floating rate debt is significantly shorter in its term-to-maturity. The result is consistent with the general notion that bank originated debt is short in term and floating rate (Datta, Iskandar-Datta and Patel, 2000; and Denis and Mihov, 2003).

Other contributing factors are firm size and credit rating and leverage. Firm size as measured by market capitalisation is found to correlate negatively with the likelihood of floating rate debt. In fact, we have seen that firm size is an important factor in determining the floating rate debt. Although a negative relationship is found between floating rate debt and market capitalisation, we also take into consideration the behaviour of smaller firms in the sample. We found that smaller firms in the sample focus mainly on natural hedging (ratio of financial assets to financial liabilities) in determining the floating rate debt ratio. The intuition for such behaviour is easy to understand; large blocks of interest rate sensitive debt could have a material effect on the financial stability of any firms if interest rates were to rapidly move in an unfavourable direction. Even in cases where firm cash-flows are positively correlated with interest rate movements, operating income may not respond to such changes as fast as payable interest rate expenses, leaving a firm more exposed to financial distress (high leverage). Bearing in mind that firms able to access the public capital markets (normally firms having credit rating) have passed a certain threshold in terms of size, transparency and quality, as described by both Diamond (1991) and Covitz and Sharpe (2005), we should not forget that this may prove more

costly for firms facing financial distress than for firms depending solely on bank debt. Bank lending (and monitoring), by definition, builds on the relationship between the lender and the borrower who can jointly negotiate on the terms of debt contract as financial distress looms and before actual default occurs. We have also seen that firms of credit quality in this thesis have credit rating and have more debt at a fixed rate, while floating rate debt is more likely issued by firms which do not have credit rating. However, having been assigned a credit rating usually indicates that the firm is at least to some extent more active in the public market domain and evidence shows that both speculative-grade as well as investment-grade firms time the market with respect to interest rate movement (Flannery, 1986; Titman, 1992). By contrast, firms lacking a credit rating seem to engage in natural hedging instead of market timing. A low issue frequency added with a lack of transparency due to the absence of a credit rating suggests that unrated firms perform issues in isolation, attempting to tap the capital to complement their mainly bank originated debt structure.

Although other studies have focused on the total floating rate debt, little has been analysed with the currency composition of foreign debt and foreign floating rate debt. It demonstrates that firms accessing foreign debt are more likely to rely on foreign currency derivatives, indicating that firm managers try to mitigate the risk when they have overseas operations. It demonstrates, moreover, that when firms have overseas operations such as foreign sales and operations such as financial assets, the coefficient of the foreign currency derivatives decreases. Moreover, foreign floating rate debt has similar characteristics to foreign debt. It shows that firms with more foreign sales and foreign financial assets have a lower magnitude of foreign currency derivatives to that of firms which do not have foreign operations. The contribution in this section of the chapter is that this study is the first of its kind to focus on the determinants of the composition of floating rate debt. It moreover, finds that the main determinants are the foreign

currency derivatives, credit rating, foreign sales, foreign financial assets and leverage. These results can help the financial manager to decide whether to borrow overseas and whether to borrow overseas at a floating rate debt.

8.6: Suggestions for future research

This study's focus mainly concentrated on outstanding debt and changes in debts. Future research could well be focused on a mere comparison of outstanding debt and new debt issuance behaviour. From this comparison, the drivers behind the issuance behaviour for frequent and infrequent issuers would be analysed. Moreover, information such as detailed grade for credit rating could be coupled with this comparison. Moreover, a better examination of the total sample of small couple with large and largest non financial firms can be taken into consideration unlike this study which focuses only on the largest non financial firms in the UK. The comparison of debt issuance and outstanding debt can help to depict the questions: are non-financial firms with higher credit rating funding their debts mainly from the capital markets? Are these firms increasingly moving away from bank financing towards market-based debt? The establishment of such future research will be based on the availability of data at hand and its reliability.

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