Internal Capital Markets and Analysts' Earnings Forecast Errors

By

Amandeep Singh Sahota

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ABSTRACT

Corporate investment decisions are among the most important decisions of a firm. Internal capital markets play a key role in facilitating the allocation of capital resources in order to finance investment projects within diversified firms.

This thesis investigates internal capital markets and its relationship with analysts' earnings forecast errors in three countries with two distinct financial systems, namely, the market-based and bank-based financial system. Using segment level data for public listed companies in the UK, France and Germany between 2005 and 2010, we examine the operation and efficiency of internal capital markets in market- and bank-based systems. We also examine the impact of the financial crisis of 2008 on internal capital markets and analysts' earnings forecasts errors, namely, the accuracy, bias and dispersion.

The findings indicate internal capital markets actively facilitate the allocation of resources within diversified firms and, in general, operate inefficiently. Furthermore, internal capital markets appear to be more active in France compared with the UK. On the other hand, their role appears to be limited in Germany, as segments appear to rely more on their own resources and less on internal capital markets for investments. In addition, we find that internal capital market activity declines and efficiency improves during the financial crisis in UK. In contrast, there is no significant evidence to suggest that efficiency improves during the crisis in France or Germany.

This research also finds some evidence to suggest internal capital markets operations aggravate firm complexity and, in turn, negatively affect short-term forecast accuracy in the UK. In addition to this, our analysis shows there is a positive relationship between the size of internal capital markets and dispersion in analysts' earnings forecasts. In general, our study shows analysts' are optimistic about firms' future performance; however, the level of optimism significantly declines during the financial crisis. Lastly, we report a positive relationship between efficiency of internal capital markets and optimism in earnings forecasts.

Keywords: Internal Capital Markets, Financial Systems, Financial Crisis, Analysts' Earnings Forecast Errors

To my parents

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Abbreviations

Capex – Capital Expenditure

DE – Germany

FR – France

ICM – Internal Capital Markets

Ind. – Industry

Q – Tobin's- Q

ROA – Return on Assets

RVA – Relative Value Added

TA – Total Assets

UK – United Kingdom

US – United States

CHAPTER 1 – INTRODUCTION

1.1. Introduction

Corporate investment decisions are important for several reasons, for example, good investment projects can enhance value of a firm, create jobs and have a positive effect on economic growth (Wulf, 2002). Internal capital markets play a key role in facilitating the allocation of resources within multi-segment firms which, in turn, enable these firms to finance good investment projects (Stein, 1997). Despite its benefits, Shin and Stulz (1998) and Rajan et al. (2000) document that internal capital markets are inefficient.

The discovery of inefficient internal capital markets in the late 1990s fuelled the debate as to what causes the misallocation of resources within firms. Researchers have looked at the link between misallocation of resources and internal power struggles (Rajan et al., 2000), rent-seeking (Scharfstein and Stein, 2000) and misalignment of interests (Jensen, 1986). A number of studies document that inefficiency may be due to poor corporate governance and lack of monitoring (e.g. Ozbas and Scharfstein, 2010; Sautner and Villalonga, 2010). However, the empirical evidence has been limited and majority of the studies have focused on the US.

In this study, we investigate the link between financial system structure of a country and internal capital markets. The objective is to determine whether financial system of a country, such as market- and bank-based system, plays a role in determining the activity and efficiency of internal capital markets. It is widely agreed that market- and bank-based financial systems significantly differ in their ability to monitor firms and provide access to capital resources (i.e. arm's-length financing and relationship-based financing) (Rajan and Zingales, 2003). For example, Chakraborty and Ray (2006) document that banks have "hands-on" approach and play an active role in the decision making process within firms.

Secondly, we examine the relationship between internal capital markets and financial analysts' earnings forecast errors. It has been well-documented that diversification can increase firms' complexity which, in turn, can aggravate forecast errors (for example, Duru and Reeb, 2002). This study aims to determine whether presence of internal capital markets within diversified firms aggravates complexity and, in turn, affects forecast errors.

In this chapter, we begin with a discussion on our research objectives and contribution to existing literature in Section 1.2. In Section 1.3, we discuss the structure of the thesis and provide a brief introduction to each chapter. Lastly, Section 1.4 summarises this chapter.

1.2. Research Objectives and Contribution

Unlike single-segment firms, multi-segment firms have the ability to operate internal capital markets, which enables them to pool resources and finance investment projects across the firm. Internal capital markets allow firms to reduce their dependence on costly external markets by financing investment projects of a segment using cash flow of other segments within the firm. Lamont (1997) initiated a stream of literature on internal capital markets and proposed a measure of the relationship between investment and cash flow at segment level.[1] The findings suggest firms actively cross-subsidise resources to finance new investment projects.

Concurring with this study, Shin and Stulz (1998) report active but inefficient internal capital markets in the US, as they find more resources are allocated to poor investment

[1] The investment-cash flow sensitivity model put forward by Fazzari, Hubbard and Petersen (1988) which consists of examining the relationship between a firms' investment and its cash flow. Lamont (1997) and Shin and Stulz (1998) build on this model by examining segments' own cash flow as well as cash flow of other segments within the firm.

projects. However, Whited (2000) argues that these results are controversial as Q, a proxy used to determine efficiency of internal capital markets, may not be a good measure for segment investment opportunities. Rajan et al. (2000) put forward an alternative approach which measures the efficiency of internal capital markets directly through one of two measures: absolute value added (AVA) or relative value added by internal capital allocation (RVA).

Their results are consistent with internal capital markets operating inefficiently and allowing segments with poor investment opportunities to invest more than their industry benchmark. These findings fuelled the debate as to why internal capital markets are inefficient. Rajan et al. (2000) argue that internal hierarchy and power struggles between divisions can affect the size of capital allocations as well the direction of the flow of resources within multi-segment firms.

Scharfstein and Stein (2000) develop a model in which divisional managers may engage in rent-seeking behaviour in an attempt to extract more resources from the CEO and distort the operations of internal capital markets. The CEO may allocate more resources through internal capital markets to the rent-seeking division in an attempt to realign managers' interests so that divisional managers become more productive.

Other researchers have documented that internal capital market inefficiency may be due to poor corporate governance (Bolton and Scharfstein, 1998; Ozbas and Scharfstein, 2000; Saunter and Villalonga, 2010). For example, Sautner and Villalonga (2010) examine the exogenous shock to corporate ownership structures resulting from the German tax reform of 2002 and its link to the efficiency of internal capital markets. In 2002, the prevailing 52 percent corporate tax on capital gains from investments in other corporations was abolished in Germany. This led to a significant reshuffling of corporate ownership structures and affected most large shareholders of major corporations. The study provides evidence of active internal capital markets and multi-segment firms with highly concentrated ownership having more efficient internal capital markets.

The question which then arises is whether the operations and efficiency of internal capital markets varies by countries with distinct financial systems that differ in their approach to monitoring firms' activities and providing capital. Cross-country evidence on activity and efficiency of internal capital markets is limited and a number of studies focus only on business groups[2]. Our study looks at conglomerates that structurally differ from business groups in one main way; segments are not financially independent in the former structure. Thus, segments within the conglomerate may rely more on internal capital markets to meet their financing needs.

The literature on activity and efficiency of internal capital markets within different financial systems is scarce. A particularly interesting issue is whether the onset of a financial crisis leads to more efficient internal capital markets, as the prior literature from the US suggests, in differing financial systems. The literature on the differences and the benefits and costs of bank-based and market-based financial systems spans over a century (Levine, 2002). The two key distinctions pointed out in prior literature are the importance of relationship-based and arm's-length based financing and differences in monitoring of firms by markets and banks (Rajan and Zingales, 2003).

Boot and Thakor (1997) argue that banks ability to coordinate a large number of small investors is a better approach than uncoordinated markets in terms of their ability to be actively involved in the firms' decision making process and supervising firms. Holmstorm

[2] For example, Carlin et al. (2008) examine internal capital markets operations in 69 countries. Gugler et al. (2013) provide international evidence on the existence of internal capital markets from 90 countries. Lee et al. (2008) find that internal capital markets are active and efficient in Korean business groups prior to the 1997 Asian financial crisis, but they become inactive after the crisis.

and Tirole (1997) suggest that banks may have a comparative advantage in terms of monitoring in that they are able to keep an eye on managers' activities and enforce contractual agreements. In line with this, Chakraborty and Ray (2006) document that banks play more active role in firms' investment project selection process and monitoring of firms.

On the other hand, a number of studies argue that financial markets can also improve corporate governance. For example, firms with weak management may become takeover targets through M&As (Scharfstein, 1998), and in the process, weak management are forced out and replaced with more competent managers. Also, financial markets can provide valuable information to management through feedback of price (Tadesse, 2001).

Finally, Rajan and Zingales (2003) document that relationship-based financing and arm's-length financing are sensitive to different types of shocks. For example, in a relationship-based system the entire firm- and project-specific knowledge is likely to be embedded within the one or a small group of banks, and in the event of severe crisis, it may be more difficult to transfer to other unaffected outsiders. In contrast, market and price signals are likely to indicate the health of market-based systems before the crisis becomes too severe and can be dealt with differently.

In this study, our primary focus is to examine the similarities and differences in activity and efficiency of internal capital markets in market- and bank-based financial system. Our analysis looks at the United Kingdom (UK), France and Germany. This is because, firstly, it has been well-documented that these three countries have distinct financial system structure (Franks and Mayer, 1997). The UK is considered to have a market-based system, while Germany and France are considered to be more bank-based (for example, Allen and Gale, 2000). Secondly, the adoption of the IFRS accounting standards in 2005 by the European Union requires greater segment-level disclosure by listed companies in member states.[3] This enables us to compare the activity and efficiency of internal capital markets across countries.

We contribute to the existing literature in several ways. Firstly, our findings reveal the importance of financial structure of the country in determining the activity and efficiency of internal capital markets. We find that internal capital markets are more efficient in bank-based system compared with market-based system. This suggests that bank-based financial system structure has important attributes such as increased monitoring of firms' activities and improves governance which, in turn, results in more efficient internal capital markets.

In line with the prior studies such as Shin and Stulz (1998) we find that internal capital markets are more inefficient in market-based systems. This suggests that, in the presence of free cash flow, managers may pursue their personal objectives or motives and misallocate resources at the expense of shareholders (Jensen, 1986). The findings are also in line with study of Lins and Servaes (1999) who find that diversified firms in the UK trade at a significant discount, but this not the case in Germany.

Secondly, we examine the impact of the financial crisis of 2008 on operation and efficiency of internal capital markets in market- and bank-based systems. The recent financial crisis of 2008 exposed fundamental weaknesses in the global financial system and had enormous economic costs in terms of lost output, significant decline in sales and investment opportunities (Kahle and Stulz, 2013). The crisis presents an interesting event as it allows us to study the interdependence of segments in different financial systems when external credit becomes more difficult to obtain.

[3] The IAS Regulation on the application of international accounting standards directly requires (without transposition into national law) the use of IFRS in the consolidated financial statements of publicly traded companies established in EU member states. It applies from the first financial year starting on or after 1 January 2005.

Our findings complement the work of Hovakimian (2011) who finds that firms improve their capital allocation process during recessionary periods when external capital becomes more difficult to obtain. Our study reveals two key findings in market-based system. Firstly, there is a significant decline in internal capital markets activity during the financial crisis and, secondly, internal capital markets become more efficient at allocating resources during the recent financial crisis. We interpret these findings as managers cutting back on inefficient cross-subsidisation of resources during the stringent financial environment.

Interestingly, we do not find a significant change in internal capital markets efficiency in bank-based financial system during the crisis. It appears that firms in market-based system experience a more stringent environment which, in turn, puts more pressure on management to improve their investment policies. For example, we find that firms in bank-based system cutback in capital expenditure to a lesser extent compared with firms in market-based system during the crisis. It may be that banks are able to provide firms with stable access to external finance during the crisis (for example see, Rajan and Zingales, 2003; Baum et al., 2011), as a result, managers are not placed under same pressure to increase efficiency. This complements the work of Hoshi et al. (1991) who document that in a relationship-based system, banks can go out of their way to rescue distressed domestic firms in order to maintain their relationships.

Thirdly, we find that internal capital markets increase firms' complexity to some extent and negatively affect analysts' earnings forecast accuracy. In specific, the size of internal capital markets has a significant impact on the long-term growth forecasts. The findings can be summarised as follows. Firstly, firms operating larger internal capital markets have greater long-term growth forecast error. We find no evidence to suggest that internal capital markets operation impact short-term growth forecasts errors. Secondly, we find that analysts are generally overoptimistic about firms' future performance, and that analysts' optimism is positively related to efficiency of internal capital markets. In line with prior literature, we find significantly less optimism during the recent financial crisis of 2008.

Our study differs from prior studies in three many ways. Firstly, recent studies that looked at cross-country evidence on internal capital markets focus only on business groups (for example, Buchuk et al., 2014). However, our objective is to examine internal capital markets within conglomerates. As discussed above, firms can be separately listed on an exchange in a business group structure and have the ability to raise finance from external markets. Segments are completed owned the firm and do not have direct access to financial markets. Thus, segments are more likely to rely on internal capital markets for their financing needs.

Secondly, prior studies examining multiple countries have generally made the comparison between developed and developing countries (e.g., Gugler et al., 2013). Our study focuses on the differences in the financial system structure of developed countries and its affect on internal capital markets. Furthermore, prior studies such as Gugler et al. (2013) do not look at the effect of financial crisis on their findings. In this study, we examine the impact of the recent financial crisis of 2008 on internal capital markets activity and efficiency within two distinct financial systems.

Thirdly, prior literature has paid significant attention to variables that may affect analysts' earnings forecast errors; however, the literature on internal capital allocation and forecasts errors is nonexistent. For example, it is now acknowledged that diversification increases firms' complexity and reduces forecast accuracy (Duru and Reeb, 2002). This study is the first to look at the link between internal capital markets within diversified firms, which can aggravate problems due to information asymmetry and increase firm complexity, and forecast errors.

Our findings have several important implications. For example, our research findings reveal, in line with prior studies, internal capital markets are inefficient and suggest that investors should consider (i) placing more emphasis on information related to investment opportunities facing the firm that may enable them to differentiate between profitable and non-profitable projects without completely relying on analysis from management, (ii) look at placing independent body within the firm that is tasked with analysing and monitoring the financing and progress of investment projects, and (iii) better mechanisms that align interests of managers with the interests of shareholders.

Our study also reveals that internal capital markets are more efficient in bank-based system. The findings suggest that policy makers in countries where the financial system has not yet fully developed such as emerging markets should consider this key advantage of banks' role in financial system. Literature on the role of markets in accelerating the growth of industries is sparse; however, banks role as financial intermediaries could itself be a source of value. The effect of good governance can lead to good corporate investments which, in turn, can support job creation and economic growth.

1.3. Thesis Structure

The thesis will consist of eight chapters and begin with a review of key studies on internal capital markets and analysts' earnings forecasts. We then discuss the data and method of determining whether internal capital markets are active and efficient. The results are presented in subsequent chapters.

To begin, we examine the literature on internal capital markets in Chapter 2. It is now well documented that a key difference between single segment and multi-segment firms is the presence of internal capital markets in the latter. Lamont (1997) and Shin and Stulz (1998) document that diversified firms operate internal capital markets and finance investment opportunities of a segment using cash flow of other segments within the firm. Thus, investment level of a segment of diversified firm not only depends on its own cash flow but also on resources available for reallocation within the firm.

Furthermore, empirical studies examining the efficiency of internal capital markets generally find that they are inefficient (Rajan et al., 2000). Diversified firms tend to prioritise lesser profitable segments over high profitable segments when allocating capital resources. Additionally, a number of studies have examined the impact of the financial crisis on operation and efficiency of internal capital markets and generally report mixed findings (Lee et al., 2008; Hovakimian, 2011; Kuppuswamy and Villalonga, 2010). Lastly, we examine literature on cross-country evidence on the presence of internal capital markets in this chapter.

In Chapter 3, we examine the literature on financial systems and establish a link with internal capital markets. In this chapter, we derive our research hypotheses from these two strands of literature. We begin with a discussion on the historical developments of the financial system in the UK, France and Germany as well as the key similarities and differences between market- and bank-based financial systems. Although the literature on financial systems is vast and dates back over a century (Levine, 2002), we focus mainly on the key differences that can effect operation and efficiency on internal capital markets.

Chapter 4 focuses on the literature on analysts' earnings forecasts and its link with internal capital markets. In this chapter, we derive our research hypotheses from these two strands of literature. We begin by examining the literature on accuracy, bias and dispersion in earnings forecasts. Next, we look at the literature that examines the factors that can affect analysts' ability to make accurate predictions, particularly focusing on complexity of the firm. Additionally, we examine key studies that suggest firms' decision to raise finance on external markets has a significant effect on the level of bias in earnings forecasts. We also discuss the literature on firm complexity and external financing in this section.

Next, Chapter 5 examines the data and method used to determine the operation and efficiency of internal capital markets. There are two main methods used in prior literature to measure the operation and efficiency of internal capital markets. The first method put forward by Shin and Stulz (1998) builds on the investment-cash flow model (Fazzari et al., 1988) by examining the link between investment by segment and cash flow of other segments within the firm. The second method was put forward by Rajan et al. (2000) which directly measures operation and efficiency of internal capital markets through the relative value added model.

Additionally, in this chapter we look at the data required at firm- and segment-level. We also discuss the IFRS 8 (which replaced the IAS 14)[4] accounting standards that requires the disclosure of operating segments by firms. We obtain this firm and segment level information for UK, France and Germany from 2005 to 2010 from Datastream. Furthermore, we obtain data on analysts' earnings forecasts for all firms in the UK, France and Germany over 2006 to 2011 from I/B/E/S (Institutional Broker Estimate System).

As a next step, we present descriptive statistics in this chapter. We examine key variables that may indicate diversified firms operate internal capital markets. We also examine the variable that determines whether they are efficient or inefficient. Furthermore, we present our data in two separate periods to study the impact of the recent financial crisis of 2008 on operation and efficiency of internal capital markets in the UK, France and

[4] IFRS accounting standards were adopted throughout the EU in January 2005 which requires firms to report segment level information, if its segments meet the set of criteria. The IFRS (8), which is mainly concerned with segment reporting, came into effect in 2009 replacing the IAS (14). There is no significant difference between the IFRS (8) and IAS (14) in terms of how segments financial data items are reported.

Germany. For example, we take 2005-2007 as non-recession and 2008-2010 as recession period.

We investigate whether more stringent environment during the financial crisis forces management to improve the efficiency of internal capital allocations. Firms in bank-based systems tend to have close relationship with investors, and hence, are likely to experience less stringent environment compared with the level of constraints faced by firms in market-based systems. Thus, we expect firms in market-based systems to improve their internal capital markets efficiency to a greater extent than firms in bank-based systems.

In Chapter 6, we present the results from empirical analysis on internal capital markets, financial systems and the financial crisis of 2008. Our objective is to document the similarities and difference in the level of activity and efficiency of internal capital markets in three countries as well as the impact of the financial crisis on their operations and efficiency. Our results indicate, in line with prior studies, internal capital markets are active and generally operate inefficiently in all three countries. The size of internal resource allocations varies across the three countries, and internal capital markets are inefficient to a lesser extent in Germany.

Furthermore, we find that firms make fewer internal cross-subsidisations of resources and become more efficient during the financial crisis in the UK. The results are consistent with Hovakimian (2011) who documents that firms improve the efficiency of internal capital markets during a recession. On the other hand, we report an increase in internal capital markets operations in France during the crisis and more resources flow towards divisions with less profitable investment opportunities. We find that operations and efficiency of internal capital markets does not change significantly in Germany.

In Chapter 7, we present our results from the empirical study on analysts' earnings forecasts and internal capital markets. We follow Bradshaw et al. (2006) and compute 1-year, 2-year and long term growth earnings forecasts errors. We take the absolute error as a measure for Accuracy and signed error as a measure for Bias. Additionally, we take the standard deviation in forecasts over mean earnings forecast as a measure of Dispersion in analysts' earnings forecasts.

In general, we find that firms which operate larger internal capital markets tend to have lower accuracy and greater dispersion in earnings forecasts. This is in line with the theory that internal capital markets increase firm complexity and reduces forecast accuracy and, in turn, increases the level of disagreement amongst analysts about the future performance of the firm. In particular, we find that the level of dispersion in long-term earnings growth estimates is positively related to the size of internal capital markets in the UK. This may be because analysts disagree more on the impact of internal capital markets on firms' profitability in the long-term.

In line with prior literature, we find that the analysts are generally optimistic and become more optimistic when firms operate efficient internal capital markets in Germany. Additionally, we find that optimism is significantly reduced during the financial crisis of 2008 and forecast accuracy significantly decreases during the crisis period compared with the non-recession period.

Finally, in Chapter 8 we summarise the findings of this research. We discuss the findings from the empirical analysis on operation and efficiency of internal markets in bank- and market-based systems, and its relationship with analysts' earnings forecasts errors. Our research objectives, empirical evidence and contribution to the literature is discussed in the next section. Finally, we discuss implications as well as possible limitations of this research and further suggestions for future studies on this subject.

1.4. Summary

In this chapter, we introduce internal capital markets and analysts' earnings forecast errors literature, and discuss our research contributions. Our main objective is, firstly, to investigate whether internal capital markets are active and efficient in the UK, France and Germany. Secondly, we document the similarities and differences in the extent of activity and efficiency of internal capital markets in market- and bank-based systems. Thirdly, we examine the impact of the financial crisis of 2008 on the operation and efficiency of internal capital markets in these two distinct financial systems.

Furthermore, we examine the relationship between analysts' earnings forecast errors and internal capital markets in the UK, France and Germany. In particular, we examine three forecast characteristics, namely, the accuracy, bias and dispersion in analysts' forecasts, and its link with the extent of activity and efficiency of internal capital markets.

This thesis consists of eight chapters. We begin by examining the literature on internal capital markets in Chapter 2. Next, we examine the literature on financial systems and document its link with internal capital markets in Chapter 3. Similarly, in Chapter 4, we examine the literature on analysts' earnings forecasts and document its link with internal capital markets in Chapter 4. In Chapter 5, we discuss the method to determine the presence of internal capital markets and present descriptive statistics. The results from the empirical analysis are presented in Chapter 6 and 7. Finally, conclusion and limitation as well as future work is discussed in Chapter 8.

Chapter 2 – Internal Capital Markets: Operation And Efficiency

2.1. Introduction

The finance literature highlights the significance of efficient internal capital markets in enabling firms to finance value-enhancing investment projects, especially when these firms experience adverse cash flow shocks (Stein, 1997; Lamont, 1997; Shin and Stulz, 1998). Despite the claims in the literature in relation to the benefits of operating internal capital markets (Maksimovic and Phillips, 2007), prior empirical studies have found that they operate inefficiently (Rajan et al., 2000; Scharfstein and Stein, 2000; Ozbas and Scharfstein, 2010). On the one hand, internal capital markets may add value by allowing firms to invest in "winner-picking" projects (Stein, 1997; 2003). On the other hand, managers may misallocate capital resources and destroy firm value (Rajan et al., 2000).

It is important to note that the prior literature has mainly focused on US conglomerates [5] and cross-country evidence on this subject has been limited. The development in accounting standards around the world and convergence towards a common set of accounting rules [6] have enabled researchers to gather international evidence on this imperative subject [7]. In this study, we utilise segment-level data for public listed companies in the UK, France and Germany to study the operation and efficiency of internal capital markets. As highlighted in Chapter 1, the study contributes to the literature in three important ways. First, we examine the operation and efficiency of internal capital markets in two distinct financial systems, namely, the bank-based system and the market-based system. Second, we examine whether and how the financial crisis of 2008 affected investment policies of multi-segment firms within different financial environments. Finally, we examine

[5] See, Maksimovic and Phillips (2007) for a review of recent literature.
[6] For an overview of international convergence of accounting standards see,
http://www.fasb.org/jsp/FASB/Page/SectionPage&cid=1176156245663
For the adoption of IFRS accounting standards in Europe in 2005 see,
http://www.iasplus.com/en/resources/ifrs-topics/europe
[7] For example, Maksimovic and Phillips (2007) provide an overview of the literature on internal capital markets. More recently, Carlin et al. (2008) examine internal capital markets operations in 69 countries. Gugler et al. (2013) provide international evidence on the existence of internal capital markets from 90 countries.

whether the operations and efficiency of internal capital is related to analysts' earnings forecast errors.

This chapter forms the foundation of this study by reviewing the literature on internal capital markets. In Chapters 3 and 4, we will build upon this review to form a set of testable hypotheses regarding the above three research contributions. In the next section, we discuss the methods used to determine the operation and efficiency of internal capital markets. Next, in Section 2.3, we examine the literature on the operations of internal capital markets. Subsequently, literature on efficiency of internal capital markets is discussed in Section 2.4. We then discuss cross-country evidence on internal capital markets in Section 2.5. The literature focusing on modelling the financial crisis and the efficiency of internal capital markets is reviewed in Section 2.6. Finally, we briefly review the literature on the link between stock based compensation, diversification discount and the efficiency of internal capital markets in Sections 2.7 and 2.8. We conclude this chapter in Section 2.9.

2.2. ICM: Determining Operation and Efficiency

There are two main methods used in the literature to determine the operation and efficiency of internal capital markets. The first approach was introduced by Shin and Stulz (1998) who built upon the investment-cash flow sensitivity model put forward by Fazzari, Hubbard and Petersen (1988). This method consists of examining the relationship between a segment's investment and its own cash flow across multi-segment and single-segment firms. In particular, Shin and Stulz (1998) examine the relationship between segment investment and the sum of cash flow of other segments within multi-segment firms (a proxy for resources available for reallocation) to determine whether internal capital markets are active.

This approach has been used extensively in recent empirical studies (see for example Gertner, Powers and Scharfstein, 2002; Lee, Park and Shin, 2008). In theory, an increase in a segment's cash flow is likely to lead to an increase in the level of resources at headquarters; hence, more resources will be available for reallocation to divisions via internal capital markets. However, a limitation of this approach is that it can only be applied to multi-segment firms.

Moreover, to determine whether internal capital markets are efficient, Shin and Stulz (1998) examine the sensitivity of segments' expenditure to its own investment opportunities as well as investment opportunities of other segments within the firm. A segment should invest more when it has better investment opportunities and invest less when it does not in comparison with other segments. However, a small number of studies claim that the inefficiency of internal capital markets reported in Shin and Stulz (1998) may be due to a measurement error in Q, the proxy for segment investment opportunities (for example see, Erickson and Whited, 2000; Whited, 2001).

The second approach was introduced by Rajan et al. (2000) which measures the efficiency of internal capital markets directly through one of two measures: absolute value added (AVA) or relative value added by internal capital allocation (RVA). This approach was not subject to the measurement error critique as documented in Erickson and Whited (2000) and Whited (2001). The AVA measures the extent to which firms over- or under-allocate capital relative to the investment opportunities in their segments' industries. RVA measures capital allocation relative not just to the industry's investment opportunities but also to the firm's own investment opportunities.

This method starts by examining the difference in the investment a segment makes being part of a diversified firm and the investment it would have made if it was a focused firm. Rajan et al. (2000) compute two additional measures of capital allocations, namely, the industry-adjusted investment and the firm- and industry-adjusted investment. The former is obtained by subtracting the average investment rate of focused firms in the same industry and year from the investment rate of a segment. The firm- and industry-adjusted investment is obtained by subtracting the asset-weighted industry-adjusted investment level of all segments within the firm from the industry-adjusted investment of a segment. RVA is estimated by weighing the firm- and industry-adjusted investment of a segment by the difference between the segment's own Q and the asset-weighted average Q of all segments of the firm.

Thus, the firm- and industry-adjusted investment indicates whether a segment invests more or less being part of a diversified firm than it would have been able to invest if it was a focused firm. For example, a positive (negative) value indicates a subsidy (transfer) received (made) by a segment. The size of an internal capital market is the absolute sum of the firm- and industry-adjusted investment of all segments within the firm (Sautner and Villalonga, 2010). These variables are discussed in more detail in Section 5.2.

This approach has also been used extensively in the prior literature (e.g. Rajan et al., 2000; Duchin, 2010; Hovakimian, 2011; Sautner and Villalonga, 2010; Kuppuswamy and Villalonga, 2010). The RVA measure can only be computed for diversified firms as it takes the investment opportunities of one segment and compares them with the investment opportunities of other segments. This means that it is zero by construction for single-segment firms (Kuppuswamy and Villalonga, 2010). As a result, the studies that use RVA restrict their sample to diversified firms only (e.g. Peyer and Shivdanani, 2001; Hovakimian, 2011). As the focus of our study is on variation in activity and the efficiency of internal capital markets across three countries before and during the recent financial crisis, we restrict our analysis to diversified firms only and, hence, we use RVA. This measure also allows for the possibility that the crisis may have changed the relative growth opportunities across segments within firms during our sample period.

2.3. ICM Operations

Unlike single-segment firms, multi-segment firms have the ability to operate internal capital markets, which enables them to pool resources at headquarters and finance investment projects across the firm (Stein, 1997; Shin and Stulz, 1998). For example, multi-segment firms can ensure that the value-enhancing projects of credit-constrained segments are financed by tilting the budget in their direction. Thus, the presence of internal capital markets can allow multi-segment firms to take action that may not be available to single-segment firms due to financial constraints (Kuppuswamy and Villalonga, 2010; Boutin et al., 2013).

Lamont (1997) examines the segment capital expenditures of oil companies between 1985 and 1986 using the investment-cash flow sensitivity model put forward by Fazzari et al. (1988)[8]. Lamont (1997) finds evidence that suggests multi-segment oil firms actively engage in cross-subsidisation of internal resources. The significant decline in the price of oil in 1986 resulted in a considerable reduction in the cash-flow of oil based segments; this had a significant negative impact on the investment level of non-oil segments of the firm. This suggests that cash-rich oil segments of multi-segment firms were subsidising the capital expenditures of credit-constrained non-oil segments. When the cash dried up, non-oil segments were forced to cut-back on their capital expenditures.

[8] The investment-cash flow sensitivity model put forward by Fazzari, Hubbard and Petersen (1988) which consists of examining the relationship between a firms' investment and its cash flow. Lamont (1997) and Shin and Stulz (1998) build on this model by examining segments' own cash flow as well as cash flow of other segments within the firm. This idea is discussed in more detail in Section 5.2.

Furthermore, the results indicate that, prior to the oil price shock in 1986, segments with below average investment opportunities invested industry-average amounts of capital expenditure, suggesting that resources were allocated inefficiently. However, after the adverse cash-flow shock to the oil segments, firms' non-oil segments reduced their capital expenditure and invested less than their respective industry median level expenditures. There was less capital flowing towards weaker segments and away from stronger segments in 1986 compared with 1985, suggesting that internal capital markets cut back on inefficient allocations and a fall in internal capital resources led to reduced overinvestment in below average segments. This finding is in line with the principle-agent models as it suggests that managers may overinvest when cash flow is freely available (Jensen, 1986).

Unlike Lamont (1997), who restricts his study to oil companies, Shin and Stulz (1998) examine a large number of non-financial multi-segment firms in the US and find evidence consistent with active internal capital markets. Shin and Stulz (1998) find that: (1) segments rely on the cash flow of other segments as well as their own cash flow for their investments, and (2) segments of diversified firms are less sensitive to adverse shocks to their cash flows than single-segment firms.

Shin and Stulz (1998) build on the investment-cash flow sensitivity argument (Fazzari et al., 1988; Lamont, 1997) to examine the relationship between the capital expenditure of segments and internal resources available for reallocation. The cash flow of other segments within a multi-segment firm in a particular year is taken as a proxy for the resources available for reallocation. The study finds that an increase in the level of resources available for reallocation at firm level leads to a positive and significant impact on the capital expenditure of segments. In addition, capital resources flow from large segments towards smaller segments within multi-segment firms, which suggest that larger segments tend to subsidise investment projects of smaller segments.

Although the evidence suggests that internal capital markets are active within multi-segments firms in the US, they perform a limited role. For example, Shin and Stulz (1998) find that segments rely significantly more on their own cash flow than cash flow of other segments within the firm. In contrast, single segment firms appear to be significantly more sensitive to their own cash flow in the absence of internal capital markets. This suggests that that internal capital markets are successful in reducing segments' sensitivity to their own cash flow; however, not to the extent that the theory suggests. Additionally, single-segment firms appear to invest less than comparable segments of diversified firms when they have low cash flow but invest more when they have a higher cash flow. This is consistent with the view that the presence of internal capital markets reduces the impact of adverse cash flow shocks and protects the segments' from cutback in capital expenditures.

In line with prior studies, Rajan et al. (2000) argue that the key distinction between single-segment firms and multi-segment firms is the presence of internal capital markets in the latter. This study examines the level of investment made by multi-segment firms between 1980 and 1993 and find evidence which suggests that internal capital markets are active. This evidence is in line with results reported in Shin and Stulz (1998) indicating that internal capital markets are active. Furthermore, they argue that internal hierarchy and power struggles between divisions can affect the size of capital allocations as well the direction of the flow of resources within multi-segment firms. In this study, Rajan et al. (2000) develop a new approach to determine the operation and efficiency of internal capital markets. As discussed in Section 2.2, the size of internal capital market can be estimated by calculating the absolute sum of all transfers and subsidies within a firm in a particular year.

Similarly, Scharfstein and Stein (2000) argue that divisional managers can engage in rent-seeking behaviour in an attempt to extract greater resources from the CEO which may distort the operations of internal capital markets. The CEO may allocate more resources through internal capital markets to the rent-seeking division in an attempt to realign managers' interests so that divisional managers become more productive. Their study finds that internal capital markets allow more resources to flow towards divisions with below average investment opportunities. Overall, the study finds that internal capital markets are active and tend to allocate a similar level of resources to all segments, i.e. 'socialism of capital resources' exists within conglomerates.

Joerg et al. (2005) examine cross-subsidisation of resources within Swiss multi-segment firms and also document the presence of the socialism of capital resources. Socialism appears to be more prominent in large firms. This study finds that Swiss multi-segment firms operate internal capital markets and that the information on the size of division, managerial reputation and past use of resources is taken into account when capital allocation decisions are made.

Scharfstein (1998) examines the segmental capital expenditure of 165 diversified firms in the US in 1979 and finds evidence consistent with active internal capital markets. This concurs with Shin and Stulz (1998), who report that internal capital markets are active. In particular, the study finds more resources flow towards weaker segments of diversified firms, which consistently invest more than the industry average. Also, smaller segments that have below average investment opportunities invest more than industry average. This suggests that smaller segments of diversified firms are likely to have smaller capital requirements, which are easily subsidised by the cash flow of larger segments within the firm.

In contrast, Khanna and Tice (2001) find that internal capital markets allocate more resources to more productive segments. The study examines the changes in the capital expenditure of segments within multi-segment firms between 1975 and 1996 in response to Wal-Mart's entry into their industry. Khanna and Tice (2001) suggest that this time period is particularly important as Wal-Mart expanded dramatically in many industries during this period and thereby "permanently changing the competitive landscape" (page 1491). During this time period, multi-segment firms were either quick to exit the industry or they stayed in and fought. Multi-segment firms that chose to stay in and fight allowed their segments to invest significantly more than single-segments firms.

Furthermore, multi-segment firms that chose to exit the industry were able to do so much quickly than single-segment firms as a result of Wal-Mart's entry into their market. This is in line with a study by Stein (1997) who argues that headquarters have greater control-rights and are able to redeploy segments' assets in other related industries more efficiently. Khanna and Tice (2001) find that multi-segment firms were able to utilise internal capital markets to allocate more resources to productive divisions as a result of Wal-Mart's entry into the market. This highlights an important benefit of internal capital markets within multi-segment firms and the advantage they have over single segment firms (Stein, 1997).

On the whole, the evidence in the literature suggests that internal capital markets are active. The presence of internal capital market enables multi-segment firms to invest in projects across the firm by allowing headquarters to shift resources from cash-rich segments towards credit-constrained segments. Overall, the empirical findings on the activity of internal capital markets appear to be consistent, whereas efficiency of internal capital markets have produced mixed findings. In the next section, we examine the literature on the efficiency of internal capital allocations within multi-segment firms.

2.4. The Efficiency of Internal Capital Markets

Despite the literature highlighting the benefits associated with operating internal capital markets (Stein, 1997; Khanna and Tice, 2001; Stein, 2003), there is substantial evidence to suggest that internal capital markets operate inefficiently (Shin and Stulz, 1998; Rajan et al., 2000; Scharfstein and Stein, 2000; Ozbas and Scharfstein, 2010). Whilst internal capital markets may add value by enabling credit-constrained segments to finance value-enhancing investment projects, they may destroy value if internal resources are misallocated within multi-segment firms. Thus, the literature on the efficiency of internal capital markets and the causes of inefficiency has grown substantially over the last two decades (Maksimovic and Phillips, 2007).

In the absence of information asymmetries and agency problems, internal capital markets are expected to ensure that segments with good investment opportunities are allocated more resources and firms' value enhancing investments remain protected during adverse cash flow shocks. However, Shin and Stulz (1998) find that internal capital markets operate inefficiently, suggesting that resources are often misallocated within multi-segments firms in the US. Internal capital markets are considered to be efficient if: (a) resources are directed towards divisions with best investment opportunities; (b) segments with good investment opportunities are protected against adverse cash flow shocks; and (c) resources allocated to a division increase or decrease in accordance with improving or deteriorating investment opportunities. This study concludes that internal capital markets operate inefficiently in general.

In particular, Shin and Stulz (1998) find that internal capital markets are not sensitive to changes in investment opportunities of segments within a firm. For example, segments continue to receive resources via internal capital markets even if they no longer have good investment projects. To determine whether capital allocations are efficient, Q is used as a proxy for segments' investment opportunities. However, it is important to note that Q cannot be computed at segment level due to lack of segment-level data. Consequently, studies usually employ the median Q of single-segment firms operating within the same industry as a proxy (as discussed in Section 5.2). In general, the evidence suggests that firms allocate more resources to low-Q divisions.

Additionally, smaller segments receive more resources via internal capital markets than larger segments, regardless of their investment opportunities. This is likely to be the case due to smaller segments having small capital requirements in the context of the total investment budget of the firm. Furthermore, Shin and Stulz (1998) find that the investment level of larger segments is not significantly sensitive to the cash flow of other segments, suggesting that larger segments usually make transfers rather than receive subsidies through internal capital markets. The study finds some evidence that suggests internal capital markets lower the investment-cash flow sensitivity of smaller segments with good investment opportunities.

Rajan et al. (2000) find that internal power struggles within multi-segment firms distort internal capital markets operations and lead to higher inefficiency. Furthermore, internal capital markets appear to be more inefficient when firms are highly diversified. For example, increased diversity in opportunities and resources within multi-segment firms leads to the alteration of the power structure in the corporate hierarchy, which then affects the capital allocation process. Within this context, Rajan et al. (2000) finds that one standard deviation increase in diversity leads to a reduction in value added by reallocation of resources of almost 10 percent of the standard deviation.

In addition, the decisions made in the multi-segment structure depend on the internal hierarchy and the presence of internal capital markets. Rajan et al. (2000) examine the value added by internal capital markets and find that they generally reduce the value of the firm. If resources are being allocated efficiently, then we would expect segments with high-Q to be the recipients of resources and, in turn, to invest more than the industry average. However, this is not the case as capital resources usually flow towards low-Q segments and away from high-Q segments.

Scharfstein and Stein (2000) develop a model to investigate the internal workings of a multi-segment firm to determine whether and how the investment opportunities of segments are systematically ranked. For example, Scharfstein and Stein (2000) consider a firm with two-segments (segment A and segment B) where resources are centralised at the headquarters but the decisions to invest in projects are decentralised at segment level. The CEO allocates a portion of capital resources to both divisions at a point in time *t-0* by ranking investment projects according to their net present value. At this point, the internal capital markets may be functioning well and the CEO may allocate resources well.

Thereafter, each divisional manager (manager A and manager B) has the option to invest in one of the two types of projects at *t+1*: an optimal project (high return) or a defensive project (low return). Investment in the optimal project is desirable as it will provide the greatest return and increase shareholder value; however, if a divisional manager is worried about resources generated at *t+2* by his or her division being shared among other divisions and expects nothing in return, then the defensive project may appear more desirable to the manager.

Rajan et al. (2000) show that the type of investment chosen affects the extent of the claim a division has on the cash flow produced because, depending on the cash flow generated, one division may have the opportunity to poach the surplus created by the other division. In this state, the CEO may allocate greater resources to the concerned manager in an attempt to realign their interests. However, allocating greater resources to one division may leave other divisions with fewer resources.

Suppose at *t+1* manager A makes an investment that will maximise firm value (i.e. the optimal investment is chosen by manager A not knowing the investment decisions of manager B), then at *t+2* both manager A and manager B will share some of the surplus created. If manager B also makes an efficient investment, then both managers will get part of the surplus created by the other division (surplus will be shared among both divisions). Even if the surplus created by manager B is smaller than what manager A is giving up, manager A will still prefer the efficient investment. Therefore, in this ideal situation appropriate incentives are created for both divisions when the surplus generated by the investment does not differ too much.

However, not all managers may choose to invest in the optimal project. The manager of a division with low productivity may choose the defensive investment and engage in rent-seeking no matter what the manager of the other division does. In contrast, the manager of a division with high productivity will avoid rent-seeking as the benefits of rent-seeking do not outweigh the benefits derived from the optimal project. Therefore, to realign the interests of the manager of a low productivity division, the CEO may offer cash compensation or tilt the capital budget in their direction. In this state, some of the resources are being misallocated through internal capital markets as weaker divisions will receive more than their due share of the resources.

Finally, it may be the case that both divisions have low productivity and may face financial constraints. In that case, it may not benefit the CEO to shift capital from one division to the other. If the CEO was to tilt resources in favour of division-manager A, this would lower the utility of manager B by at least as much as the utility of manager A was raised. Hence, retaining both managers is not the cheap option for the CEO. Instead, the CEO may choose to pay off both rent-seeking managers with cash in order to retain them. However, this will result in inefficient internal capital markets.

If manager A attempts to extract more resources from the CEO and obtain another division's resources, then manager B is likely to resort to the same methods of rent-seeking, possibly leading to a more serious internal problem. When internal power struggles are at their peak, it is also likely that managers will engage in unproductive outside activities in an attempt to enhance their image and reputation in the market. In this instance, internal capital markets are operating inefficiently and may lower the value of the firm. In this situation, even if one manager wants to invest in value maximising projects, he or she may be reluctant to do so if they believe that other division-managers will not do the same. This is because at $t+2$ the headquarters will split the total surplus according to the division's relative power.

Rajan et al. (2000) argue that the optimal scenario would be when all division-managers invest their resources in the most efficient way and, thus, maximise the firm's value. In this case, both managers are satisfied with their levels of capital allocation. Hence, as managers will be fully occupied with their projects they will not waste resources and try to obtain additional resources from other divisions or engage in unproductive outside activities. In this scenario, there are no attempts to distort the function of internal capital markets.

In order to ensure internal capital markets operate efficiently, the CEO must provide strong incentives for managers to select optimal projects to make the personal gains from investing in the weaker project and rent-seeking appear less attractive (Scharfstein and Stein, 2000; Rajan et al., 2000). Scharfstein and Stein (2000) argue that the final payoff from the optimal investment must be more than the payoff from the defensive investment to ensure that sufficient incentives are in place so that optimal investments are always chosen for investment.

Suppose the end of the year payoff to the manager if the optimal project is chosen for investment is their salary x_1 plus any private benefits associated with investment in the optimal project x_2. If the defensive project is chosen for investment, then the private benefits associated with this investment will be x_3, where $x_2 > x_3$. Alongside the defensive project, the division-manager has the opportunity to engage in unproductive rent-seeking activities to extract more resources from the CEO. The private benefits to the division-manager from engaging in rent-seeking and outside image building may be y_1. Now, if they choose to invest in the weaker project, then their final compensation will be their salary, private benefits from rent-seeking and any outside benefits: $x_1 + x_3 + y_1$.

For this reason, the CEO must ensure that optimal incentives are in place to prioritise strong investment projects over weaker investment projects, i.e. the benefit from investing in optimal project outweighs the benefits from defensive project and rent-seeking. If the final compensation from investing in the optimal project is less than the compensation from investing in defensive projects, then managers will have an incentive to choose the latter and engage in unproductive activities. Additionally, over time the division-manager is likely to have acquired some specific human capital, which makes him or her particularly valuable and powerful. This means that the division-manager may be able to bargain for increased compensation and force the CEO to tilt the budget in their favour (Wulf, 2009). For example, if the division-manager leaves immediately, then he or she will have to be replaced, the total output will be reduced and the surplus will be reduced by a greater amount. The CEO must provide incentives not only to retain the manager but also to ensure that the efficient investment projects are prioritised and are the most rewarding option for managers.

Wulf (2009) documents that divisional managers are able to distort the signals headquarters receives about divisions' investment opportunities. For example, the CEO receives two types of signals about segments' investment opportunities on which the capital allocation decision will be made; a highly noisy public signal and a private signal that can be distorted by managers. The public signal, i.e. segment Tobin's-Q, is a noisy measure, but it is free from distortion by division-managers. The private signal, which includes assessments about new product development, the adoption of a division's product as a standard or a pending sale to a large customer, can be distorted by the division-manager in order to extract greater resources from the CEO.

The CEO may verify the value of the private signal but at a cost. Thus, headquarters face a trade-off between the cost of an accurate private signal and the value of the information the signal provides. If the CEO believes the private signal may be distorted, then he or she may pay more attention to the public signal. For this reason, Wulf (2009) argues that instead of being a measure of efficient capital allocation, increasing sensitivity to Tobin's-Q may be the firm's attempt to mitigate division-manager incentives to distort informative private signals (i.e. managerial recommendations). This is in contrast to much of the internal capital markets literature that implicitly assumes that efficiency increases with divisional investment sensitivity to industry Tobin's-Q (Shin and Stulz, 1998; Rajan et al., 2000; Scharfstein and Stein, 2000).

More recently, Duchin and Sosyura (2012) have examined the impact of social connections between divisional managers and the CEO on the efficiency of internal capital markets within S&P 500 firms. Social connections are defined by three types of social networks: connections via education, connections via previous employment and connections via non-profit organizations. Following Shin and Stulz (1998), efficiency of internal capital markets is measured by the relationship between a division's capital expenditure and its relative investment opportunities (the imputed Tobin's-Q of the division relative to the imputed Tobin's-Q of the other divisions). If social connections between the CEO and the divisional managers improve the quality of information about divisions' investment opportunities, then they are likely to improve investment efficiency in the firm.

Duchin and Sosyura (2012) find that a one standard deviation increase in a divisional manager's social connections to the CEO is associated with 9.2% more capital being allocated to his or her division. This is equivalent to approximately $5.3 million in additional annual capital expenditure in a division with median characteristics. Firms with weaker governance (as proxied by the Gompers, Ishii, and Metrick (2003) index of low managerial ownership, low institutional holdings and the social connections between divisional managers and the CEO) are associated with lower investment efficiency and lower firm value. Firms with high information asymmetry (measured by industry relatedness across divisions, the dispersion of operations across divisions (the Herfindahl index), the distance from the headquarters to divisions and the social connections between divisional managers and the CEO) are positively related to investment efficiency and firm value.

Xuan (2009) investigates how the employment history of the CEO can influence the capital allocation decisions made within multi-segment firms in the US. The study finds that divisions the new CEO has advanced through receives fewer resources compared with divisions not previously been affiliated with the CEO. If the CEO of the firm was a former division manager, has advanced through the ranks and has not worked in other businesses, then he or she is likely to allocate more resources to the divisions he or she has least knowledge about. This pattern of reverse favouritism in capital allocation is more pronounced if the new CEO has less authority or if the unaffiliated divisions have more bargaining power.

In addition to this, Xuan (2009) finds that having a specialist rather than generalist CEO has a negative impact on the efficiency of internal capital markets. Generalists are defined as new CEOs who have either rotated through all the divisions in their firms before being appointed as CEO or who have always worked in a general role. On the other hand, specialists are defined as new CEOs who have advanced through the ranks from certain divisions in their firms. Overall, this study investigates the reason behind diversification, and concludes that it is a strategy pursued by managers who aim to control large corporations (Xuan, 2009).

These findings are in line with Shleifer and Vishny (1989), who argue that managers are more likely to be interested in investments that require their specific human capital, thereby protecting themselves against possible future replacement. If they are successful in building specific human capital over time, it will be harder to remove them and difficult for their successor to take over their role. This study shows that the new CEO is likely to tilt the capital budget toward the division formerly under his or her control, effectively empire building, which will increase the job security of the CEO. Additionally, CEOs are likely to be overconfident about projects to which they are highly committed to or about which they are highly knowledgeable (Weinstein, 1980), and this could lead to overinvestment in the division the CEO has progressed from. If the CEO displays favouritism, then the internal capital market may fail to allocate resources efficiently.

Lastly, Geddes and Vinod (1997) find that young CEOs are more concerned about reputation then senior CEOs and, hence, more likely to engage in diversification. Their ability to control large multi-segment firms may enhance their image and lead to more rewarding opportunities in the future. Narayanan (1985) finds that more experienced managers are less likely to opt for short-term profits. An experienced manager has already proved his or her worth and this reduces the manager's incentive to choose short-term profits over long-term growth. Geddes and Vinod (1997) find that the longer the duration of the manager's contract the less probability there is that he or she will choose sub-optimal investment projects.

2.5. ICM and the Financial Crisis

While substantial progress has been made in modelling internal capital markets and financial crises, prior empirical findings on this subject have been mixed. On the one hand, internal capital markets allow managers to “winner-pick” investment projects and enable segments to finance those projects during financially constrained states such as a financial crisis (Hovakimian, 2011). On the other hand, Lee, Park and Shin (2009) find that internal capital markets were functioning well prior to the 1997 financial crisis in Korea and ceased to operate after the crisis. It has now been documented that capital expenditures, sales and assets fall significantly during a crisis (Kahle and Stulz, 2013) and external finance becomes more difficult to obtain during economic downturns (Hovakimian, 2011). In turn, internal capital markets add value by enabling credit-constrained segments to finance good investment projects, thereby filling the role of external markets (Kuppuswamy and Villalonga, 2010).

Unlike prior empirical studies that focus primarily on US diversified firms, Lee, Park and Shin (2009) focus on the investment policies of Korean business groups before and after the Asian financial crisis of 1997. The study finds evidence to suggest that internal capital markets were active only before the crisis. Following Shin and Stulz (1998), Lee, Park and Shin examine the relationship between cash flow and capital expenditure of group-affiliated firms. The cash flow of other group-affiliated firms is taken as a proxy for the internal resources available for reallocation. The study finds a positive and significant relationship between investment of a firm and cash flow of other group-affiliated firms. This suggests that group-affiliated firms rely significantly on the cross-subsidisation of resources for financing their investment projects.

Furthermore, high profitable investments are prioritised over less profitable investments prior to the crisis, indicating that internal capital markets were operating efficiently. For example, Lee, Park and Shin examine the relationship between proxy for investment opportunities (Tobin's-Q) and capital expenditure, and find more resources are allocated to divisions with high investment opportunities. Unlike Shin and Stulz (1998), who take median Tobin's-Q of single-segment firms as a proxy for a segment's investment opportunities, Lee, Park and Shin are able to compute Tobin's-Q for each of the group-affiliated firm. Unlike segments within conglomerates, group-affiliated firms in Korea are listed separately on the exchange and have the ability to access external markets for finance. In the study, the coefficient of Tobin's-Q turns out to be positive and highly significant, showing that diversified firms pay attention to the investment opportunities of firms within the group when allocating resources. Firms with good investment opportunities receive more resources for investment via the cross-subsidisation of resources in Korea, which contrasts with the inefficient internal capital markets in the US as reported by Shin and Stulz (1998).

Lee et al. (2009) suggest that despite the efficient cross-subsidisation of resources prior to 1997, internal capital market operations contracted significantly after the crisis. Their findings show that internal capital markets were barely functioning during the post crisis period. This suggests that group affiliated firms which suffered an adverse cash flow shock after the crisis bore the full impact of that shock and internal capital markets failed to protect even the best investment opportunities of credit-constrained firms. After the crisis, group affiliated firms rely more on external finance for financing investment projects and, thus, appear to have operated more like non-group affiliated firms.

The contraction in internal capital markets has mainly been linked to government intervention during the crisis, which discouraged group-affiliated firms from engaging in the cross-subsidisation of internal resources. Prohibitions, such as restricted cross-holdings and cross-debt guarantees, closed some of the important channels of internal capital distribution. Instead, external capital markets, such as bonds issues, replaced the role of internal capital markets. In this instance, diversified firms that operated efficient and value-enhancing internal capital markets are likely to have suffered the most. In turn, diversified firms that operated inefficient and value-diminishing internal capital markets are likely to have benefited indirectly from the new regulations.

Furthermore, research examining the financial crises and internal capital markets in the US finds that resources are allocated inefficiently prior to a crisis (in line with Shin and Stulz, 1998; Rajan et al., 2000) and more efficiently during recessionary periods (Hovakimian, 2011; Kuppuswamy and Villalonga, 2010). In particular, managers cut back on unnecessary capital allocations and prioritise good investment projects during recessionary periods.

Hovakimian (2011) examines the investment policies of US multi-segment firms from 1980 to 2008 across business cycles and finds that internal capital markets become more efficient during an economic downturn. The business cycles are classified as recessionary and non-recessionary based on the National Bureau of Economic Research (NBER) Business Cycles Expansions and Contractions data. The study indicates that capital allocation policies improve when external credit becomes more difficult to obtain in financially constrained states compared with financially relaxed states. With limited access to external capital, diversified firms protect the budgets of divisions with more valuable investment opportunities by decreasing the capital allocation to divisions with less valuable investment opportunities.

Thus, external shocks to their credit supply lead to tighter control over existing resources. Conglomerates that are more constrained or bank-dependent are more vulnerable to credit supply shocks, and they are identified by dividend payout, firm size, commercial paper rating and the Kaplan and Zingales (1997) index. The three measures of internal capital allocations, namely, capital expenditure, industry-adjusted capital expenditure and firm- and industry-adjusted capital expenditure, indicate that significantly more resources flow towards high-Tobin's-Q segments and fewer resources flow towards low-Tobin's-Q segments during financially constrained periods. However, the efficiency gained during financially constrained periods reverts back to the pre-constrained level after the economic downturn. For example, RVA is negative prior to the recessionary period, but significantly improves (although still negative) during financially constrained periods and then reverts back to pre-recession level.

In addition to this, Kuppuswamy and Villalonga (2010) examine the impact of the 2008 financial crisis on the value of multi-segment and single-segment firms and find that the diversification discount decreases significantly during a crisis in the US. This is related, firstly, with the ability of multi-segment firms to offer insurance benefits of diversification. Secondly, multi-segment firms have the ability to reallocate resources in order to finance valuable investment projects, i.e. engage in “winner-picking” of investment projects (Stein, 2003). Focused firms do not operate internal capital markets and, therefore, are more sensitive to credit- and cash-flow shocks.

Furthermore, the study examines the relationship between the value of conglomerates and internal capital markets efficiency using quarterly data between 2005 and 2009 and find that multi-segment firms improve the efficiency of their internal capital markets during a crisis which is associated with increase in firm value. These findings are generally in line with Hovakimian (2011). The three measures that are used to identify the period and magnitudes of the financial crisis are time dummy variables, TED (difference between three-month LIBOR and the yield on three-month Treasury bill) and the Chicago Board Options Exchange Volatility Index (VIX).

Following Rajan et al. (2000), Kuppuswamy and Villalonga compute the absolute value added by allocation (AVA) and report a significant increase in efficiency of internal capital markets during a recession compared with the pre-recession level. However, internal capital market efficiency reverts back to non-recession level after the crisis (in line with the findings of Hovakimian (2011)). Overall, the results are consistent with the existence of an internal capital market channel through which the value of diversification increased during the financial crisis. While diversified firms were able to utilise their internal capital markets to ensure good opportunities were getting financed, single-segment firms were not.

2.6. ICM: Cross-Country Evidence

Gugler et al. (2013) examine the investment-cash flow relationship within large business groups across 90 countries between 1995 and 2006. In line with the main findings of Shin and Stulz (1998), their study finds that the investments of subsidiaries are generally positively related to the parent firms' cash flow and negatively related to the parent firms' investment opportunities. This suggests that diversified firms across countries operate internal capital markets and transfer resources which enable group affiliated firms to finance investment projects. However, the evidence on active internal capital markets varies by country as large and significant parent firms' cash flow coefficients are found in some countries and insignificant cash flow coefficients are found in others. Such mixed findings indicate signs of working/non-working internal capital markets within different firms and financial environments.

Furthermore, whilst analysing the factors which lead to active or inactive internal capital markets, Gugler et al. (2013) find that internal capital markets are more active when (i) the parent firm has a high controlling stake in the subsidiary, (ii) parent firms' are from a country with "strong" institutions and subsidiaries are from a country with "weak" institutions and (iii) unlisted subsidiaries are much more dependent on internal capital markets than listed subsidiaries. The measure of financial development of a country is based on the World Bank WGI index of institutional development as well as direct measures, such as private credit to GDP ratio of the country. The findings appear to suggest that well-functioning internal capital markets may be costly as only parent firms with a large ownership stake are able to ensure they work efficiently. Moreover, parent firms from a well-developed country with strong institutions, possibly due to their superior monitoring and experience, are better able to operate internal capital markets. In turn, parent firms with a low ownership stake and/or from a less-developed country are less likely to have well-functioning internal capital markets.

Internal capital markets can be used in an attempt to alleviate cash constraints when external capital markets are unavailable, such as in under-developed countries. Consequently, firms in such countries engage in the cross-subsidisation of internal resources by systematically ranking investment opportunities across divisions/subsidiaries. For example, Gugler et al. (2013) find evidence that headquarters pay attention to the investment opportunities of the subsidiary (Tobin's-Q) when allocating resources. Additionally, the investments of unlisted subsidiaries are much more sensitive to parent firms' cash flow than the investments of their listed counterparts. Subsidiaries from countries with weak institutions and/or less well-developed financial markets are more dependent on internal capital markets than their counterparts in countries with strong institutions and/or well-developed financial markets.

Carlin et al. (2008) examine the investment-cash flow sensitivity of diversified firms in 60 countries. In particular, their study focuses on the investments of foreign subsidiaries that are listed on the local exchange and the cash flow of the parent firm. They find that internal capital markets exist and parent firms appear to have a financing relationship with their separately listed subsidiaries. The findings suggest that parent firms actively engage in the cross-subsidisation of resources, and investment opportunities (measured by Tobin's-Q) of subsidiaries play a key role in determining the direction of the flow of resources. There is evidence suggesting that foreign affiliates often substitute internal borrowing for external borrowing when operating in environments with poorly developed financial markets. Moreover, this transfer is negatively related to the investment opportunities of the parent firm, suggesting that finance is allocated in response to the relative profitability of projects within the group.

Further international evidence on the existence of internal capital markets is provided by Buchuk et al. (2014), who examine the intra-group lending of business groups in Chile from 1990 to 2009. Unlike conglomerates with fully owned subsidiaries, firms affiliated with business groups in Chile can be separately listed on the stock market and issue debt or equity independently. As a consequence, the internal capital markets of business groups can have an effect on capital structure that is absent from conglomerates. The study finds that lending relationships are more likely to be formed by firms that are (i) close to each other in the control pyramid, (ii) belong to the same industry and (iii) are in more integrated industries.

Moreover, there exist two hypotheses related to the direction of capital flow representing two opposing views: the tunnelling hypothesis and the financing advantage hypothesis. The former predicts that loans go from firms in which the controlling shareholder(s) has low cash flow rights to firms in which the controlling shareholder has high cash flow rights. Whereas, the latter predicts that the direction of loans depends on the financial constraints of firms within the group (the difference between investment opportunities and the cost of funding in each firm) regardless of whether the controlling shareholder has high control rights. The study finds that firms that are net receivers of intra-group loans have higher cash flow rights than firms that are net providers of intra-group loans. Furthermore, the receivers of intra-group loans are typically small, capital-intensive firms with higher investment rates than providers.

Similarly, Gopalan et al. (2007) investigate the intra-firm allocation of capital resources in Indian business groups and find evidence of well-functioning internal capital markets. Internal capital markets allow group-affiliated firms to raise finance internally when external markets are not fully developed and costly. In particular, the cross-subsidisation of resources plays an important role in transferring resources and is mainly used to financially support weaker firms.

For example, the evidence indicates that groups extend loans to financially weaker firms and significantly increase the extent of the loans when member firms are hit with a negative earnings shock. Meanwhile, there is little evidence to suggest that group loans finance good investment opportunities as the receivers of internal resources tend to underperform significantly. Moreover, business groups provide more loans to firms with higher insider holding. However, in contrast to prior studies that find resources flow from high-Tobin's-Q segments to low-Tobin's-Q segments, Gopalan et al. (2007) find that internal capital markets are mainly used to support member firms in trouble.

In addition to this, Boutin et al. (2013) investigate whether entry into manufacturing industries in France is affected by the cash reserves accumulated by firms affiliated with business groups. For example, cash-rich business groups may use internal capital markets to alleviate financial constraints and enhance a firm's competitive strength. Moreover, potential entrants could be wary of markets dominated by cash-rich groups if internal capital markets are perceived as very efficient. By examining the relationship between entry rate into an industry and the cash holding of group-affiliated firms in the market as well as the cash holding of other firms in the affiliated business group, Boutin et al. (2013) find evidence that is consistent with the theory of active internal capital markets. In particular, internal capital markets operated by cash-rich groups relax the financial constraints affecting group affiliated firms by providing them with more resources via the cross-subsidisation of resources compared with other potential entrants who do not have access to such financial infrastructures.

Furthermore, the effect of a group's deep pockets on entry is amplified in markets where group affiliated firms are more efficient. The efficiency of group-affiliated firms in a market during a particular year is taken as the weighted average of the incumbents' total factor productivity. The total factor productivity is estimated by taking the deviation between the observed output and the predicted output over a period of time, the predicted output being obtained from a direct estimation of a production function. The results indicate that internal capital markets are successful in reducing the financial constraints of the more productive group firms. Hence, efficiency and financial constraints interact in determining the competitive strength of group-affiliated firms in France.

Furthermore, Sautner and Villalonga (2010) examine the exogenous shock to corporate ownership structures resulting from the German tax reform of 2002 and its link to the efficiency of internal capital markets. In 2002, the prevailing 52 percent corporate tax on capital gains from investments in other corporations was abolished in Germany. This led to a significant reshuffling of corporate ownership structures and affected most large shareholders of major corporations. Sautner and Villalonga (2010) find evidence of active internal capital markets and multi-segment firms with highly concentrated ownership having more efficient internal capital markets in Germany.

Following Rajan et al. (2000), Sautner and Villalonga use relative value added by the capital allocation (RVA) measure to determine the efficiency of internal capital markets and the relationship with ownership concentration of the firm. Internal capital markets are taken to be efficient if funds are allocated to divisions with good investment opportunities (Shin and Stulz, 1998), thus increasing shareholder wealth. German firms, much like US diversified firms, are required to disclose segment level information as well as information on shareholders who have more than a 5 per cent stake in the firm. A novel finding is that concentrated ownership improves corporate governance mechanisms, which in turn put pressure on managers to select good investment projects thus improving the efficiency of internal capital markets.

Moreover, consistent with prior literature, Sautner and Villalonga (2010) find that multi-segment firms that have highly concentrated ownership are less diversified and more efficient than firms with less concentrated ownership. These findings are consistent with the theoretical arguments in Bolton and Scharfstein (1998) and Scharfstein and Stein (2000), which suggest that capital misallocations are partly a result of poor corporate governance. As corporate diversification has benefits and costs (Berger and Ofek, 1995; Lins and Servaes, 1999; Hubbard and Palia, 1999; Kuppuswamy and Villalonga, 2010; Schwetzler and Rudolph, 2011), the finding that firms with high concentrated ownership are less diversified and have more efficient internal capital markets may indicate that the presence of large investors counteracts some of the agency costs involved with diversification (Jensen, 1986).

This suggests that diversification is value-destroying in general because if diversification is value-enhancing and internal capital markets are efficient, the net benefits of ownership concentration are likely to be zero or negative.

2.7. ICM Efficiency and Managers' Compensation

It is well documented that the internal capital allocation process can be distorted by internal power struggles within multi-segment firms (Rajan et al., 2000; Scharfstein and Stein, 2000). For this reason, prior empirical studies have examined the role of stock-based compensation to realign the interests of managers and create strong incentives for the CEO and division managers to invest in good projects. For example, Datta et al. (2009) examine the internal capital allocations and CEO compensation within multi-segment firms in the US between 1992 and 2003 and find that CEO compensation plays a key role in determining whether internal capital markets are efficient or inefficient. The literature suggests that if the cost to managers for misallocating capital resources is significant or greater than the associated private benefits, then the managers are much less likely to misallocate resources.

Furthermore, Datta et al. (2009) find that there is a positive link between the value of the firm and CEO compensation. Given the significant relationship between the financing of good corporate investments and a firms' value, inefficient internal capital markets were partly held responsible for the diversification discount (see Maksimovic and Phillips', 2007 literature review on diversification). Thus, Datta et al. (2009) argue that having stock options as part of CEO compensation packages can increase the efficiency of internal capital markets and, in turn, increase the value of diversified firms.

Aligning the interests of managers and shareholders has been the focus of recent corporate governance literature. Stock-based compensation remains an active research area (Wulf, 2002; Datta et al., 2009), the main aim being to design compensation packages that minimize agency costs. Hirshleifer and Suh (1992) argue that compensation plans including a stock option can help mitigate the effects of avoiding excessive risk by giving managers incentives to adopt rather than avoid particular risky projects. During the past two decades, there has been a record rise in the number of firms using stock options and stock ownership to reward managers and most firms now require CEOs to own a certain level of stock in their firm, and CEO compensation is now comprised of almost 40% stock options (Forbes, 1998).

2.8. ICM and Firm Value

The costs and benefits of corporate diversification have now been well documented in the prior literature (Maksimovic and Phillips, 2007). It is now acknowledged that the efficiency of internal capital markets can have an impact on the value of the firm and the so called "diversification discount" (Berger and Ofek, 1995; Rajan et al., 2000; Kuppuswamy and Villalonga, 2010). On the one hand, internal capital markets can allocate resources efficiently (Stein 1997; 2003), which in turn, may enhance firm value. On the other hand, internal capital markets may destroy value if capital resources are allocated inefficiently e.g. due to empire-building (Jensen, 1986), agency behaviours (Scharfstein and Stein, 2000) or managerial entrenchment (Shleifer and Vishny, 1989).

In general, the literature on the value of diversified firms compared with the value of a portfolio of single segment firms has reported that the former trade at a significant discount (Berger and Ofek, 1995). Lins and Sarvaes (1999) provide international evidence by examining the value of diversified firms in the UK, Germany and Japan, and find that diversified firms trade at a significant discount in the UK and Japan, but this is not the case in Germany.

In relation to this, Rajan et al. (2000) examine the relationship between firm value and the efficiency of internal capital markets between 1980 and 1993. In their analysis, the dependent variable is the excess value of diversified firms compared with portfolio of focused firms. Efficiency of internal capital markets is measured using RVA and AVA. The findings suggest that there is a positive relationship between efficiency and firm value. A well-functioning internal capital market requires resources to be allocated based on opportunities which can lead to enhanced firm value; however, firms appear to misallocate resources in general, which can lead to lower value.

Kuppuswamy and Villalonga (2010) examine the relationship between firm value and internal capital markets before and after the financial crisis of 2008. Their findings suggest that value of diversification increases during the financial crisis which is mainly due to the debt coinsurance provided by diversified firms and internal capital markets becoming more efficient when external credit become more constrained during the crisis. The authors document that shareholders may accept the costs of internal capital markets during stable period in return for the ability to reap its benefits when external capital becomes constrained.

2.9. Summary

Corporate investment decisions are amongst the most important decisions a firm makes (Wulf, 2002). Internal capital markets facilitate the allocation of resources and, in turn, enable the financing of investment projects within multi-segment firms (Lamont, 1997; Stein, 1997). Thus, it is well documented that a key distinction between single-segment firms and multi-segment firms is the presence of internal capital markets in the latter (Stein, 2003). Despite the extensive literature that disputes the benefits and costs of internal capital markets (Khanna and Tice, 2001; Ozbas and Scharfstein, 2010), it is now widely agreed that internal capital markets allow resources to be directed towards segments with weak investment opportunities and away from segments with strong investment opportunities (Rajan et al., 2000; Scharfstein and Stein, 2000).

On the one hand, internal capital markets can add value by facilitating the allocation of resources so that segments with good investment opportunities are able to finance their projects. For example, Lamont (1997) finds that capital resources from cash-rich oil segments are used to finance investment projects in other non-oil segments within multi-segment firms. Unlike external investors, headquarters has greater control-rights over segments, which allows "winner-picking" of investment projects and enables managers to finance those projects by cross-subsidising resources (Stein, 1997, 2003). In line with this theory, Khanna and Tice (2001) find that internal capital markets enabled productive segments of the firm to finance more investment projects in response to Wal-Mart's entry into their market.

On the other hand, prior empirical studies have found that managers do a poor job of allocating resources (Shin and Stulz, 1998; Rajan et al., 2000; Scharfstein and Stein, 2000) and, engage in value-diminishing activities and misallocate internal resources. For example, Shin and Stulz (1998) find inefficient internal capital markets in US multi-segment firms. Similarly, Rajan et al. (2000) argue that internal power struggles lead to the misallocation of internal resources. In addition to this, Scharfstein and Stein (2000) find evidence of the socialism of capital within internal capital markets.

Furthermore, Hovakimian (2011) argues that easy access to external capital and free cash flow aggravates the allocation inefficiencies that exist within the conglomerate structure.

For example, in the presence of free cash flow and the absence of appropriate incentives and monitoring, managers are likely to invest in both positive net present value projects and negative net present value projects that are of special interest to them (Jensen, 1986; Stulz, 1990), which can lower the efficiency of internal capital markets. In line with this theory, Hovakimian finds evidence suggesting that managers improve internal capital allocation policies only when faced with adverse shocks to their credit supply, for example during a recession. Similarly, Kuppuswamy and Villalonga (2010) report a significant decrease in the inefficiency of internal capital markets and, in turn, an increase in the value of multi-segment firms during the recent financial crisis of 2008 in the US.

However, prior empirical studies focusing on other economies have not always reached a similar conclusion. Gugler et al. (2013) find that internal capital markets are active in some countries and inactive in others. Lee, Park and Shin (2008) find that internal capital markets in Korea operated efficiently prior to the 1997 Asian financial crisis and ceased to operate after the crisis. Similarly, Sautner and Villalonga (2010) find that internal capital markets are efficient in firms with highly concentrated share ownership. In this study, we examine the operation and efficiency of internal capital markets within diversified firms in three of the largest economies in the EU, namely, the UK, France and Germany. Furthermore, we examine the impact of the recent financial crisis of 2008 on the operation and efficiency of internal capital markets in these three countries with two distinct financial systems, namely, the market-based and bank-based system.

In Chapter 3, we begin by discussing the literature on market-based and bank-based financial system in the UK, France and Germany. In particular, we examine the literature on the differences and similarities between the two opposing financial systems. We then discuss our research questions on how these differences may affect operation and efficiency of internal capital markets within multi-segment firms.

Chapter 3 – Financial Systems And Internal Capital Markets: Related Literature And Hypotheses

3.1. Introduction

The finance literature pays considerable attention to the significance of the country's financial system architecture on the financing and investment decisions of firms (see for example, Demirguc-Kunt and Maksimovic, 2001). This literature suggests that the design of a financial system not only affects the availability of capital (e.g. Rajan and Zingales, 2003) but also the capital allocation decisions within the firm (e.g. Chakraborty and Ray, 2006). A number of studies have documented that there are key distinctions between the market- and bank-based financial systems (Rajan and Zingales, 2003; Tadesse, 2002; 2003), namely, the importance of bank and market finance, relationship-based against arm's-length financing and the supervisory role of markets and banks which may affect the capital allocation process.

The present chapter builds upon this literature and derives hypotheses regarding the link between the financial system and internal capital markets in the UK, France and Germany. The discussion in this chapter (and in the rest of the thesis) builds upon the literature that considers the UK to have a market-based financial system and France and Germany to have a bank-based financial system (e.g. Franks and Mayer, 1997; Allen and Gale, 2000). The literature review presented in this chapter aims to produce testable predictions relating to the following research question: does the design of the financial system affect the operations and the efficiency of internal capital markets?

In Section 3.2 we review the literature on the key distinctions between bank-based and market-based financial systems. In particular, we focus on the importance of market and bank finance, supervisory role of markets and banks and the ownership structure of firms in these two systems. Next, we derive predictions from the literature on internal capital markets and financial systems in Section 3.3. Finally, we draw conclusions in Section 3.4.

3.2. Comparison of Bank-based and Market-based Financial Systems

The development of the financial system of a country is essential for economic growth, risk sharing, allocation of resources, diversification and regional and international trade (Tadesse, 2003). A well functioning financial system facilitates the efficient transfer of resources from units in surplus to units in deficit (Boot and Thakor, 1997). In addition, prior research documents that markets and banks perform supervisory roles (Tadesse, 2003), which can affect the investment decision of firms (Chakraborty and Ray, 2006).

The UK, France and Germany all have well-developed financial systems, but there are notable differences in the role and importance of banks and markets (Allen and Gale, 2000). Consequently, we discuss (i) historical developments of the financial system in the UK, France and Germany, (ii) the importance of market- and bank-finance, (iii) design of financial systems, and (iv) the key differences in monitoring as well as ownership dispersion of firms in these two systems.

3.2.1. Historical Developments: An Overview

It is argued that the years 1719 and 1720 were critical to the development of the UK's financial system, as well as that of France, because of two interlinked events: the South Sea Bubble in England and the Mississippi Bubble in France (Allen and Gale, 2000). In the UK, for example, the intense speculation and the swift rise and fall of the South Sea Company in 1720 which caused great uncertainty led the government to put in place tighter regulation (e.g. the Bubble Act of 1720) creating barriers to company formation for many years.

The London Stock Exchange was established in 1802 and the Bubble Act was abolished. The abolishment of the Act resulted in a significant increase in the number of publicly listed companies in London. The development of Britain's infrastructure and a large amount of capital flowing through the system increased the importance of the Exchange. In specific, the government's intervention in response to the South Sea Company crisis and the long-term framework put in place thereafter shaped the financial system in the UK. A well-developed market orientated financial system emerged in the UK (the Anglo-Saxon model).

The Mississippi Bubble, which occurred around the same time as the South Sea Bubble in England, affected the development of the stock market and banks for many years in France. It began with Bank Generale, established in 1716, which became the first institution to issue notes without 100 percent reserves. The bank later merged with another company to form the Mississippi Company, which became the subject of intense speculation between 1719 and 1720. The rise and fall of the Mississippi Company due to this intense speculation led the French government to impose tighter regulations on the formation of the stock markets.

The Bank of France was established in 1800, and there was also a stock exchange in Paris at this time. However, there were only a few listed companies, and the majority of trading was in government debt (Rousseau and Sylla, 2003). Hoffman et al. (2000) document that the loans being arranged by notaries in the absence of loan markets during the 1800s in France show the lag in financial development. In the 1850s, the French opened another bank to fund the development of the country's infrastructure. Soon after its success, other banks were formed to provide funding for specific sectors, for example, construction and agriculture. As a result, banks performed a vital role in providing finance to firms, while markets played a lesser significant role (Allen and Gale, 2000). As a result, a well-developed bank-based model emerged in France (the continental European model). Prior to the 1990s, there were six regional stock exchanges and the most important of them all was the stock exchange located in Paris. During the 1990s, reforms introduced by the French government created a single national market so that stocks could be traded at any exchange.

While financial development was occurring in the UK and France, Germany was still politically fragmented, with many states having their own rulers (Rousseau and Sylla, 2003). In terms of its financial system, Germany was lagging behind even France until its unification in 1871, which led to the formation of new banks. Allen and Gale (2000) document that many Germans had spent time in France and witnessed the formation of Credit Mobilier and other financial institutions. This led to the formation of Dresdener Bank in Germany by those influenced by the French situation to provide funds for industrial firms. Commerzbank and Deutsche Bank soon appeared to help fund foreign trade.

German banks soon formed a nationwide network akin to those in the UK and France. A noticeable difference was the links between banks and firms, which became substantially stronger. These relationships led to the formation of the *Hausbank system* by which firms have a close relationship with banks that are their primary source of external finance (Allen and Gale, 2000). The control that the banks had over the firms also grew substantially. The majority of the firms were privately held, with bank-based finance remained the primary option and only a small percentage of firms were publically listed. After the Second World War, there were many regional stock exchanges in Germany, and the Frankfurt stock exchange established as the leading stock exchange in the country. However, there are fewer firms are listed on the German stock exchange than in the UK or the US.

More recently, Rajan and Zingales (2003) report a trend towards a market-based system within Europe. Many countries in Europe now have more firms listed on the stock exchanges than they did two decades ago and government initiatives and reforms have led to increased competition. In particular, the growth in the derivatives market across Europe from

$2.7 billion in 1986 to $2.4 trillion in 2001 has been particularly astonishing (Rajan and Zingales, 2003). The derivatives market in Germany that opened in the 1990 continues to lag behind those in the UK and the US in terms of trade volume (Rajan and Zingales, 2003).

Thus, despite the trend towards the market-based system in Europe, banks still play a significant role in continental Europe compared with the UK or the US. For example, Baum et al. (2011) document that in 2006 the ratio of private credit by deposit money banks to GDP is 2.5 times higher in Germany than in the US, whilst stock market capitalisation to GDP is lower in Germany than in the US.

The Paris Bourse, which is now part of Euronext, became a major stock exchange and one of the most important in Europe. In addition, other markets, such as the derivatives market was also set up in the 1980s to rival the UK's derivatives exchange. Despite the significant increase in activity in the stock exchange in France and market capitalisation, loans remained much more important than shares as a new source of funds (Allen and Gale 2000).

3.2.2. The Role of Market and Bank Finance

Demirguc-Kunt and Levine (2004) distinguish between market-based and bank-based financial systems of the country by examining the ratios of banking sector development relative to stock market development. In particular, by grouping countries in terms of the size, activity and efficiency of their banking sector and stock market, Demirguc-Kunt and Levine classify a system as bank-based or market-based financial system. In line with prior literature (Franks and Mayer, 1997; Allen and Gale, 2000), the study finds that the UK is more market orientated whereas France and Germany appear to be more bank orientated. In general, the study finds that stock markets tend to become more active and efficient at allocating resources relative to domestic banks in higher income countries.

Similarly, Franks and Mayer (1997) document that in the UK around 80% of the largest 700 companies are listed on the stock exchange, which account for around 81% of GDP. In contrast, Germany and France can be described as bank-based economies, with 700 and 500 quoted companies, respectively, accounting for only 25% or less of GDP. This shows that quoted companies (i.e. companies raising capital in the stock market) in Germany and France are responsible for a much smaller fraction of total national corporate activity than those in the UK. Table 3.1 presents descriptive statistics on the importance of markets and banks financing in the UK, France and Germany in 2005. The size of equity markets is usually represented by stock market capitalization to GDP ratio. Whereas, the size of the credit sector is measured, alternatively, by (a) the size of total domestic credit relative to GDP and (b) the size of total credit to the private sector relative to GDP.

Table 3.1

Importance of Markets and Banks.

	GDP ($)	Banking Assets ($)	Equity Market Capitalisation ($)	Banking Assets / GDP (%)	Equity Market Cap / GDP (%)	Stock Traded / GDP (%)
U.K.	2,321	3,625	3,057	156.2	131.7	179.5
France	2,136	1,980	1,758	92.7	82.3	71.4
Germany	2,766	3,115	1,220	112.6	44.1	63.7

This table shows the importance of markets and banks in UK, France and Germany in the year 2005. Banking Assets is the domestic credit to private sector by banks. Equity Market Capitalisation shows the market value of the domestically incorporated companies listed on the country's stock exchange. Stock Traded is the total value of shares traded during 2005. All amounts are in billions of US dollars.

Source: World Bank.

As shown in Table 3.1, markets appear to be more active and play a key role in allocation of resources in the UK compared with France and Germany. In line with this, Rajan and Zingales (2003) show that the difference in bank deposits between market-based and bank-based systems is significant; in fact, deposits relative to GDP are 60% greater in continental Europe than in the UK. The reverse is true regarding the importance of stock markets. Additionally, this study documents that the US companies issued equity equivalent to 1.2% relative to GDP between 1991 and 1995, compared with German corporations which issued equity amounting only to 0.04% of GDP during the same period.

Furthermore, Rajan and Zingales (2003) document that the financial markets in the UK remain highly important for new IPO's as well as existing domestic and international companies. The Eurobond market, based in London, provides governments and banks with the ability to raise finance through bonds. Other markets, such as the derivatives and commodities markets, are also active and play a more significant role in the UK compared with France or Germany.

In contrast, banks appear to play a more important role compared with stock markets in Germany and France. Allen and Gale (2000) also document that in 1993 the ratio of banking assets to GDP was 152 percent, whereas the ratio of equity market capitalisation to GDP was only 24 percent at that time in Germany. Additionally, Rajan and Zingales (2003) document that 16% of borrowing by firms in the US was from banks in 1994, compared with 80% of corporate borrowing in Germany was from banks during the same period.

3.2.3. The Role of the State in Financial Systems

Stiglitz et al. (1993) argue that possibility of disruption to the financial system through macroeconomic shocks is one of the more important reasons for government intervention in the corporate sector. The collapse of a financial institution can have adverse effect on other institutions and governments cannot sit idly by when faced with such a situation. Therefore, the government can perform the role of an insurer. However, the insurance provisions may alter behaviour of managers, giving rise to problem of moral hazard. Managers of the insured firm have reduced incentives to avoid the insured-against event.

Demirguc-Kunt and Maksimovic (1998) document that government intervention in corporate sector can distort market incentives and enable firms to raise finance on favourable conditions because of explicit/implicit guarantees by the government. In addition to banks and markets, government in France has played a key role by (i) controlling companies via nationalisation (Allen and Gale, 2000; La Porta et al., 1998, 2002), and (ii) nationalising banks that provide credit to non-financial domestic firms (Rajan and Zingales, 2003).

For example, the government in France has significant ownership in some of the largest firms and banks in the country.[9] However, there has been a recent trend towards privatisation of some of the major corporations that were under the control of the state and it shows that the government made an enormous effort to reform the financial and industrial sectors. Table 3.2 shows the government subsidies relative to GDP in the three countries in our analysis.

[9] At the beginning of 2005, the French government had 100% ownership in GDF and EDF, and 95% ownership in Areva. GDF and EDF were privatised in 2005 and Areva was privatised in 2006. The government had 10.17% stake in Areva, 84.48% in EDF and 36% in GDF in 2010.
Source: Company Annual Reports.

Prior empirical literature documenting the effects of privatisation on the efficiency and profitability of firms generally report significant improvements in the performance of firms after divestiture (Vickers and Yarrow, 1988; D'Souza and Megginson, 1999). This strand of literature claims that the improvements in the efficiency and profitability of firms were at the highest when the transfer of ownership from the state to private shareholders increased competition in the market. In addition, banks have become less regulated in France following the 1984 Banking Act, which created a new legal framework encompassing all credit institutions, subjecting them to the same regulatory and supervisory authorities (Mehran, 2001).

Table 3.2

Role of the State in Financial Systems.

	Growth Rate (%)	Inflation (%)	Law and Order Indicator	Government subsidies (% of GDP)
UK	2.3	5.8	4.5	1.5
France	1.8	5.7	5.0	2.4
Germany	1.8	2.8	5.5	2.0

The table shows the average economic and institutional factors between 1980 and 1991 in the UK, France and Germany. Law and Order Indicator are scored between 0-6 and a higher score indicates strong court systems and political institutions. Government subsidies (as a percentage of GDP) show grants on current account by the public authorities to private and public corporations as well as government enterprises.

Source: Demirguc-Kunt and Maksimovic (1998).

3.2.4. Ownership Dispersion

Prior literature documents a significant difference in the level of dispersion in ownership of firms in these two financial systems (La Porta et al., 2002). Modern corporations in developed countries usually have a large degree of separation between ownership and control (Jensen and Meckling, 1976; Fama, 1980). However, the separation is to a lesser extent in bank-based systems as shown in Table 3.3. This table shows the significant difference in ownership structure of firms in the three countries.

While ownership can be dispersed among many shareholders (La Porta et al., 2002), control is usually concentrated among managers (Berle and Means, 1932, 1991). The separation of ownership and control coupled with high dispersion in shareholding can lead to agency problems. For example, managers with substantial free cash flow may misallocate capital resources, causing a range of problems, such as the firm may grow beyond optimal size (Jensen, 1986).

Rajan and Zingales (2003) document that, in 1994, top 5 shareholders held 42% and 25% shares of large corporations in Germany and the US, respectively. Furthermore, individuals held 50% (17%), non-financial companies held 14% (42%) and banks held zero (10%) outstanding shares in the US (Germany). The significant stake in large companies by other non-financial companies resulted in ownership that is much more concentrated in Germany than it is in the UK or the US.

Table 3.3

Ownership Dispersion in the UK, France and Germany.

	Widely held	Family	State	Anti-director rights
UK	1.00	0.00	0.00	High
France	0.60	0.20	0.15	Low
Germany	0.50	0.10	0.25	Low

This table shows the ownership structure of publicly listed firms in the UK, France and Germany in 1995. The widely held variable equals 1 if there is no controlling shareholder (20% or more). Family and State variables equal 1 if a family or state is the controlling shareholder (20% or more). The anti-director rights index is formed by adding 1 when: (i) the country allows shareholders to mail their proxy vote to the firm; (ii) shareholders are not required to deposit their shares prior to a General Shareholders Meeting; (iii) cumulative voting or proportional representation of minorities in the board of directors is allowed; (iv) an oppressed minorities mechanism is in place; (v) the minimum percentage of share capital that entitles a shareholder to call an Extraordinary Shareholders Meeting is less than or equal to 10 percent; or (6) shareholders have pre-emptive rights that can only be waived by a shareholders' vote. The index ranges from 0 to 6 and a country is classified as having High or Low anti-director rights if its score is above or below the median, respectively.

Source: La Porta et al. (1998, 2002).

3.2.5. Corporate Governance

Good corporate governance mechanisms may counteract the problem created by lack of monitoring by shareholders. This is precisely where board of directors can play an important role in overseeing the firms' activities. There are notable differences in the set-up of the board of directors in these three countries (Adams et al., 2009). For example, in the UK (like the US) the main internal and external controls for corporate governance are the board of directors and the market for corporate control, respectively (Scharfstein, 1998; Tadesse, 2003). The primary role of the board is to provide guidance and oversee management activities and, in turn, the role of management is to implement the policies set by the board. The board members are elected by the shareholders, and, thereafter, responsible for making decisions in the interest of those shareholders and it usually consists of internal and external members.

In France and Germany, publicly listed firms have much more concentrated ownership of securities compared with firms in the UK. Corporations are just one type of economic organisation; most firms in these countries are family owned, state owned, worker cooperatives and non-profit organisations (Allen and Gale, 2000). Corporate governance in Germany is very different from the UK and US, with the Co-determination Act of 1976 being one of the most important relative regulations (Pistor, 1999). Firms in Germany usually have two boards, namely, the supervisory board and the management board. The supervisory board is the controlling board, half of its representatives being elected by the shareholders, and the other half by the employees. This board is responsible for supervising the firm's activities. The management board is appointed by the supervisory board, and it is responsible for the operations of the company. The dual-board structure is a key distinction of German firms from firms in the UK and US which have a single board structure.

Lastly, French firms may have a single-board or a dual-board structure (Allen and Gale, 2000). In firms with a single-board structure, the shareholders elect a board, which then selects the CEO. The board consists of internal and external directors representing the interests of the shareholders. In firms with a dual-board structure the shareholders elect the supervisory board, which then elects directors. Their role is to oversee the firm's activities and the management of the company. As state ownership is more common in France than other countries, government representatives may also be on the board.

3.2.6. Supervisory Role of Markets and Banks

Jensen (1986) argues that in a world of uncertainty and incomplete information, the problems associated with imperfect information and moral hazard may affect first-best value-maximising investment behaviour. Thus, it is argued that increased monitoring can counteract some of the problems associated with moral hazard (Sautner and Villalonga, 2010). However, prior literature documents that monitoring by market- and bank-based systems differs significantly (Chakraborty and Ray, 2006).

A key distinction between bank-based and market-based financial systems is the importance of relationship-based and arm's-length based financing in these two systems (Rajan and Zingales, 2003). In the former structure, both parties (borrower and the lender) work to maintain their relationship which ensures the steady stream of future cash flows within the same group of firms. In the latter, investors have little interference with firms' operation (Chakraborty and Ray, 2006) and enforcement of contracts may be left more on the court system in the country.

Charkaborty and Ray (2006) suggest that banks and markets mainly differ in their involvement in the decision making process of the firm. On the one hand, banks typically adopt a “hands-on” approach and are actively involved in investment project selection process and monitoring of firms. On the other hand, market finance is more of an arm’s-length situation and presumes little involvement in a firm’s internal decisions. Banks have a comparative advantage in terms of monitoring in that they are able to keep an eye on managers’ activities and enforce contractual agreements (Holmstorm and Tirole, 1997). It is precisely here that our research aims to contribute to the literature. Our objective is to investigate whether increased monitoring in bank-based systems compared with market-based systems results in higher internal capital markets efficiency.

Markets and institutions mitigate the consequences of imperfect information and moral hazard by producing information about the firm and its management (Tadesse, 2003). In addition to information production, markets and institutions facilitate the monitoring of firms’ decision-makers in various ways. Tadesse (2003) documents that the capital market performs two key functions, namely, facilitating the allocation of capital resources from units in surplus to units in deficit (Boot and Thakor, 1997) and facilitating good governance through information production and monitoring (Chakraborty and Ray, 2006).

Furthermore, Tadesse (2003) finds that the efficiency of capital allocation and governance in financial systems are both significant determinants of firms’ growth and productivity, and that the impact of governance is more significant on productivity. This suggests that monitoring and good governance have a significant impact on how resources are allocated within the firm. Chakraborty and Ray (2006) document that while good governance improves efficiency, the allocation of capital helps to accelerate technological advances.

In general, these results suggest that increased monitoring facilitates responsible governance within firms and, in turn, puts pressure on managers to make good investment decisions (Sautner and Villalonga, 2010). Scharfstein (1988) argues that the threat of takeover via capital markets can also help to reduce managerial inefficiencies. Inefficient management gets forced out or taken over through the mechanism of the market for corporate control which can help align managerial incentives and prevent managerial actions that waste a firm's resources.

Holmstrom and Tirole (1997) distinguish between bank- and market-finance according to the information content. The study suggests that bank monitoring resolves moral-hazard problems at the level of the firm. Firms with low marketable collateral and high incentive problems borrow from banks, while wealthier firms rely on unintermediated market-finance. Hence, as Boot and Thakor (1997) point out, bank lending is likely to be important when investors face ex post moral hazard problems, with firms that have higher observable qualities borrowing from the capital market.

Bhattacharya and Thakor (1993) and Thakor (1995) document that banks play an important role in screening investment and credit worthiness of potential borrowers. Banks are more likely to have greater information due to their close relationship with the firm. Whereas, in market-based systems investors rely more on market or price signals for investment decisions (Rajan and Zingales, 2003). Capital markets play a more significant role when borrowers raise finance for optimal decisions and, market and price signals provide valuable guidance for their performance (Allen, 1993).

Dewatripont and Maskin (1995) investigate the borrower's choice of obtaining finance from banks and markets, and find that market-based systems deter poor projects but can also pass good investment projects. In contrast, bank-based systems have soft budget constraints and suffer from unprofitable projects. These findings are in line with the literature on the impact of relationships on distortion of capital allocation process within systems. Diamond and Dybvig (1983) document that the role of banks in a model in which the superiority of bank financing over financial market funding is due to the superior risk sharing provided by the bank-based systems.

Additionally, the length of time a firm-bank relationship has been established is another key factor in borrower's choice of obtaining financing from the bank (Allen and Gale, 2000). An advantage to the banks is that the terms of the contract may be negotiable and banks have the option to insert clauses in the contract, such as extract payments in the event of a firm not being able to meet its obligations. However, the information about the firm and its investment opportunities may be restricted only to the bank or a few lenders, and, therefore, financing will reflect the bank's view and to what extent it values the project.

For example, banks in Germany specialise in a range of services (Allen and Gale, 2000), and clients do not need to go anywhere else for their banking needs as the bank represents a "one-stop shop". On the upside, Hoshi et al. (1991) show that in the 1980-1990s banks went out of their way to assist financially distressed clients in order to maintain their relationship. However, a limitation of this model is that firms could be restricted to limited number of lenders. If a bank loan is the main source of funding for a project, and a business is unable to secure a loan because the bank considers the project to be too risky or does not fully understand the client's new business, then the project may not get financed.

Another key advantage for banks is that having close relationships with firms can help mitigate the problem of information not being immediately available in public markets (Boot, Greenbaum and Thakor, 1993). Lastly, Boot and Thakor (1997) argue that banks ability to coordinate a large number of small investors is a better approach than uncoordinated markets in terms of their ability to be actively involved in the firms' decision making process and supervising firms.

In contrast, market-based systems allow publicly listed firms to reach out to a wide range of investors (Levine, 2002). As the information about listed firms is publicly available in this system, investors are able to price the securities using the information currently available. These securities usually have highly liquid secondary markets, which investors can buy into or, alternatively, sell their stock (Bhide, 1993). In addition, market-based systems may also enhance corporate governance, assisting takeovers, making it easier to tie managerial compensation to firm performance (Jensen and Murphy, 1990) and facilitating risk management (Levine, 1991; Obstfeld, 1994).

Finally, Rajan and Zingales (2003) document that relationship-based financing and arm's-length financing are sensitive to different types of shocks. For example, in a relationship-based system the entire firm- and project-specific knowledge is likely to be embedded within the one or a small group of banks, and in the event of severe crisis, it is more difficult to transfer to other unaffected outsiders. In contrast, market and price signals are likely to indicate the health of market-based systems before the crisis becomes too severe and can be dealt with differently.

In the next section, we draw on the literature on key distinctions between these two systems and internal capital markets to derive our research questions.

3.3. Financial Systems and ICM

In this section, we rely on the literature on internal capital markets and financial systems to derive a set of research questions. In particular, we focus on key distinctions between market- and bank-based systems, and how they may have an impact on the activity and efficiency of internal capital markets. Furthermore, we investigate the impact of the financial crisis of 2008 on internal capital market activity and efficiency in these two distinct financial systems.

3.3.1. ICM Operations and Financial Systems

It has now been acknowledged that internal capital markets operations are affected by both the availability of internal capital and access to external finance (e.g. Hovakimian, 2011). On the one hand, firms may raise finance by approaching capital markets directly, and on the other hand, they may borrow from the bank (i.e. relationship loan). Song and Thakor (2008) argue that certification to verify creditworthiness and cost associated with approaching external markets are two key frictions that impede borrowers' ability to raise finance.

Rajan and Zingales (2003) document that relationship-based financing in bank-based system works very differently from arm's-length financing in market-based system. In the latter, firms can reach wider circle of investors and obtain finance at a competitive rate. Whereas, in the former structure, firms raise finance from a single or few banks and information in such a structure is generated by contracts rather than posted publicly. Lenders are likely to communicate between each other and collectively have more information about the investment project.

Additionally, Dewatripont and Maskin (1995) investigate the borrower's choice of obtaining finance from banks and markets, and find that market-based systems deter poor projects but can also pass good investment projects. In contrast, bank-based systems have soft budget constraints and suffer from unprofitable projects. This evidence suggests that firms may be able to finance projects through bank-finance which may have not been possible through financial markets.

On the other hand, Demirguc-Kunt and Maskimovic (2002) examine the firms' access to external finance in market- and bank-based system and find that there is no significant difference. The stock market and banking system affect firms' ability to obtain finance differently, but only in less developed countries. The differences in market- and bank-based financing appear to be related to the level of development of country's contracting environment.

Taken together, the discussion suggests that there are merits and costs of having stock markets and banks as the organisers of transfer of capital from savers to investors. On the one hand, the literature suggests that banks may perform better in situations where there is high information asymmetry (e.g. Song and Thakor, 2008). On the other hand, market-based system can create financial innovation incentives and accelerate industry growth (Tadesse, 2001). Nevertheless, firms in bank-based system may have an advantage from their close relationship with banks when obtaining external finance and, as a result, may be able to finance projects that may not have been financed on capital markets. From agency perspective to financial system, active monitoring can provide reassurances to banks about future prospects of the firm. Firms' ability to raise external finance more easily is likely to result in more resources available for reallocation within the firm. Therefore, our first hypothesis is as follows:

Hypothesis 1.1: Internal capital markets are more active in bank-based system than in market-based system.

3.3.2. ICM Efficiency and Financial Systems

An efficient internal capital market should enable capital resources to be directed towards segments with strong investment opportunities and away from segments with weak investment opportunities (Shin and Stulz, 1998). Despite the benefits of internal capital markets (Stein, 2003), prior literature finds that they are inefficient (Rajan et al., 2000; Scharfstein and Stein, 2000; Ozbas and Scharfstein, 2010). Prior studies have shown that failures in corporate governance can lead to inefficient internal capital markets (e.g. Sautner and Villalonga, 2010).

The question which then arises is that, to what extent does the financial system structure that differs in its ability to monitor firms affects the efficiency of internal capital markets? For example, Holmstorm and Tirole (1997) suggest that banks have a comparative advantage in terms of monitoring in that they are able to keep an eye on managers' activities and enforce contractual agreements. Similarly, Chakraborty and Ray (2006) document that banks play more active role in investment project selection and monitoring firms.

Thus, the role of banks in a financial system may be a source of value by itself. The presence of banks and their involvement in firms' decision making process may lead to more efficient investment policies and, therefore, reduce the misallocation of resources. This, in turn, is likely to improve the efficiency of internal capital markets. In the absence of active monitoring, managers are more likely to misallocate resources. This will, in turn, reduce the efficiency of internal capital markets.

However, it has also been documented that markets can also play a key role in improving governance of firms in three main ways. Firstly, literature suggests the threat of being acquired and replaced through M&A can discipline managers and improve governance by putting more pressure on managers to improve their capital allocation process

(Scharfstein, 1998). Secondly, markets can provide valuable signals to managers through the feedback effect of prices (Boot and Thakor, 1997). Thirdly, institutional investors, armed with more advanced technologies, can also participate in the monitoring of firms and management (Stulz, 1999).

The above discussion suggests that banks and markets both play a key role in monitoring firms. However, there are important distinctions in how firms are monitored in these financial systems. Our next objective is to determine whether banks active role in firms' decision making process leads to more efficient internal capital markets.

Hypothesis 1.2: Internal capital markets are more efficient in bank-based system than in market-based system.

3.3.3. Financial Systems, ICMs and the Financial Crisis

It is well documented that firms' cash flow, investment opportunities and capital expenditure decline significantly during a financial crisis (Kahle and Stulz, 2013). In addition to this, external finance becomes more expensive and difficult to obtain during financially-constrained periods compared with financially-relaxed periods (Hovakimian, 2011), which can put managers under more pressure to improve efficiency of internal capital markets.

However, firms' ability to access external markets may differ during a crisis in market- and bank-based system. It has been well-documented that, in relationship-based system, banks can go out of their way to organise a rescue and recovery for firms' in financial distress (Hoshi et al., 1991; Rajan and Zingales, 2003). For example, prior studies on Japanese Keiretsus show that main banks went out of their way to help financially distressed firms by first providing debt guarantees and then planning a rescue. Rajan and Zingales (2003) suggest that the incentives to help would have been much weaker if a firms' business was not concentrated within one or few banks.

Hoshi, Kashyap, and Scharfstein (1991) examine investments by Japanese firms that had close ties to banks and compared their investment behaviour with a sample of firms that had no such ties. The study finds that the investments of firms that had no bank ties were more sensitive to the cash flow generated from their operations and a negative shock to their cash flows led to significant decline in investment spending. By contrast, the investments of firms with strong relationship with the banks were significantly less sensitive to adverse shocks to their cash flow.

Hoshi et al. (1991) and Peek and Rosengren (1998) also find that banks went out of their way to maintain their domestic relationships, even when they appear to be less profitable. For example, during the period of rising real estate prices in Japan and the US in the 1990s, Japanese banks increased their lending to Japanese and the US commercial real estate market. When the real estate prices declined in Japan, the Japanese banks cut back on their lending in the US, even though the prices were still increasing in the US. During this time, they significantly increased their lending in the domestic market where prices were plummeting. This suggests that rather than cutting back on losses, Japanese banks poured more resources into unprofitable relationships at home and even bypassing good investment opportunities overseas.

Thus, we argue that, on the one hand, if external markets become more expensive and firm-wide sales falls during recessionary period (Campello et al., 2011; Hovakimian, 2011; Kahle and Stulz, 2013) then firms are likely to finance less investment projects via internal capital markets. This is because there are likely to be fewer resources available to reallocate at firm level during the crisis. On the other hand, if firms' experience a less stringent environment due to their close relationship with lenders, such as banks, and then their access to external resources are likely to be affected to a lesser extent. We are less likely to see a significant difference in the internal capital markets operations.

Hypothesis 1.3: Internal capital markets operations become less active during the financial crisis in market-based system than in bank-based system.

Lastly, Campello et al. (2010) report that financially constrained firms planned deeper cuts and relied more heavily on lines of credit, having to bypass valuable investment opportunities during the crisis. Under these conditions, Hovakimian (2011) reports that multi-segment firms in the US improve the efficiency of internal capital markets during crisis, hence, enable good segments to finance their investment projects. The study finds that the increase in efficiency is mainly a result of managers improving the quality of project selection due to the reduction in free cash flow.

Although the literature on the link between internal capital markets and financial crisis is now well developed, the link between financial system architecture and efficiency internal capital markets remains largely unexplored. Whilst the recent financial crisis is likely to have created a stringent environment and put managers under more pressure to make the best use of existing resources, the level of pressure on managers to improve efficiency may differ in difference financial systems. This is because firms in bank-based system are likely to have closer relationship with lenders and, as a result, have stable access to bank-finance (e.g. Hoshi et al., 1991). Thus, from a financial constraints perspective, managers are less likely to significantly improve the efficiency of internal capital markets in the absence or weaker external credit constraints.

Hypothesis 1.4: Internal capital markets efficiency improves more in market-based system than in bank-based system during the financial crisis.

3.4. Summary

The market-based and bank-based systems are two opposing financial systems (Boot and Thakor, 1997; Allen and Gale, 2000; Rajan and Zingales, 2003). The two key distinctions which have been linked to the efficiency of internal capital markets are the supervisory role of banks and markets (Chakraborty and Roy, 2006) and the level of ownership dispersion (La Porta et al., 2002; Sautner and Villalonga, 2010). Despite the recent trend towards market-based system in Europe, the UK is a good example of a market-based system, and France and Germany are good examples of bank-based systems (Franks and Mayer, 1997).

Gugler et al. (2013) find that the operation of internal capital markets depends on country characteristics as well as firm characteristics, while Sautner and Villalonga (2010) find that the efficiency of internal capital markets is positively related to firms' ownership concentration. In this section, we put forward our research questions on the operation and efficiency of internal capital markets in two distinct financial systems across three countries. If internal capital markets are active and efficient, then we expect segments with good investment opportunities to be the receivers of capital resources. Furthermore, we determine the impact of the financial crisis of 2008 on the operation and efficiency of internal capital markets in these three countries.

In Chapter 4, we review the literature on analysts' earnings forecast errors and establish a link with the operations and efficiency of internal capital markets. We examine three forecast characteristics, namely, accuracy, bias and dispersion. In particular, we argue that internal capital markets increase the complexity of firms and, hence, positively related to forecast errors.

Chapter 4 – Analysts' Earnings Forecast Errors And Internal Capital Markets: Related Literature And Hypotheses

4.1. Introduction

It is now well documented that financial analysts play a key role in the capital resources allocation process in an economy by producing research reports which help to reduce information asymmetry between firms' management and external market participants (Ramnath et al., 2008; Hall and Tacon, 2010). Hall and Tacon (2010) document that analysts provide investors with valuable information about the profitability and investment opportunities facing firms and enable them to make profitable investment decisions. Thus, the quality of the information produced by analysts has been of significant importance to investors as well as regulators (Hilary and Hsu, 2013).

A number of studies find that firm complexity is negatively related to the accuracy of the earnings forecasts issued by analysts (Plumlee, 2003; Duru and Reeb, 2002). For example, Duru and Reeb (2002) find that diversified firms that operate in multiple industries and geographical locations have lower accuracy and higher dispersion in earnings forecasts in comparison with focused firms in their industry. Building on the literature on internal capital markets, the aim of this chapter is to determine whether the presence of internal capital markets within diversified firms increases firm complexity and, in turn, effect analysts' forecast errors.

In Section 4.2, we review the literature on analysts' earnings forecasts errors, namely, accuracy, bias and dispersion. Next, we briefly discuss the literature on buy/sell recommendations in Section 4.3. In Sections 4.4 and 4.5, we examine the literature on the relationship between forecast errors and firm complexity as well as external financing. Finally, in Section 4.6, we develop our research questions relating to forecast errors and the internal capital markets within multi-segment firms. Section 4.7 concludes the chapter.

4.2. Analysts' Forecasts: An Overview

Analysts' usually provide three key measures in their research reports, namely, earnings forecasts, target price and buy/sell recommendations. These research reports can assist investors in identifying profitable investment opportunities and, not surprisingly, the quality of this information has been the subject of many prior empirical studies.[10] Boni and Womack (2006) examine the role of analysts as industry specialists and find that they create value mainly as a result of their superior ability to rank stocks within industries. The study finds that analysts' recommendations can lead to profitable trading strategies.

Prior empirical studies examining the impact of analysts' research reports on stock prices find that markets respond within 15 minutes to buy/sell recommendations issued by analysts (Kim, Lin and Slovin, 1997). Brav and Lehavy (2003) also find that markets react incrementally to target price revisions while controlling for market reaction to stock recommendations and earnings forecast revisions. In line with this evidence, several other studies have shown that forecast revisions and recommendations have a significant impact on security prices, and these prices tend to move in the direction of forecasts (e.g. So, 2013).

Sinha et al. (1997) suggest that some analysts' forecasts should carry more weight than others when formulating market expectations because some analysts provide better forecasts than others. The authors argue that prior literature has relied upon the average forecast as a proxy for market perception. However, this may not be an accurate perception of the market because if investors are aware that the forecast accuracy of some analysts is better, they are likely to pay more attention to those forecasts. Therefore, investors should consider analysts' past performance and more weight should be placed on the forecasts of analysts who are consistently more accurate than others.

[10] See Ramnath et al. (2008) for a review of current literature on analysts' earnings forecast errors.

A number of studies have looked at the factors that enable some analysts to perform better than others (e.g. Clement, 1999). This area of research has not only received considerable attention from academics but also from regulators who have scrutinised the factors that may lead to systematic errors by analysts (Hilary and Hsu, 2013). This is because systematic errors may distort the capital allocation process within financial markets. Prior empirical studies have examined the type of information used to make the forecasts i.e. firm- and industry-level information (Berger et al., 2003), the differences in incentives to issue more accurate forecasts (Clement, 1999) and the institutional and regulatory setting that could impede their ability to make accurate forecasts (O'Brien and Bhushan, 1990).

Overall, the estimates and research reports provided by analysts are likely to be useful only if they are accurate and successful in reducing the information gap between the firms' management and external market participants (Hilary and Hsu, 2013). Therefore, analysts' ability to accurately and consistently forecast firm performance has received considerable attention in the literature (Ramnath et al., 2008). In the next subsections, we review the literature on three forecast characteristics, namely, the accuracy, bias and dispersion.

4.2.1. Accuracy and Bias

Analysts are frequently evaluated based on the accuracy of their recommendations and short-term earnings forecasts (Dechow et al., 2000). Gu and Wu (2003) claim that accuracy is one of the most important aspects of analysts' forecast performance. Therefore, determining accuracy and bias in forecasts is fundamental to market participants when this information is being used to form market expectations and/or investment decisions.

Jackson (2005) finds that less sophisticated investors are more likely to be misled by biased forecasts if they are unable to "de-bias" them correctly. Prior literature suggests a number of reasons for biased forecasts. For example, analysts are more likely to issue biased forecasts if their incentives are linked to the amount of business they are able to generate for their firm (e.g. Hayes, 1998). This is because by satisfying firms' management through optimistic forecasts, analysts may be able to generate more business for their firm, such as trading commissions (Hayes, 1998).

In line with this, Irvine (2003) finds that optimistic recommendations generate higher own-broker trading volume. This study also suggests that analysts are more likely to issue optimistic recommendations when they are faced with mixed incentives i.e. issuing more accurate forecasts against generating more business for their firm by issuing optimistic forecasts. Additionally, Aitken, Muthuswamy, and Wong (2001) find that buy recommendations lead to a higher market share in an event window around the announcement, while sell recommendations do not. These results are in line with Jackson (2005) who verifies the optimism reported in prior studies and the trade-off an analyst faces between generating more trade and accuracy.

On the other hand, it may be the case that analysts react differently to new information which, in turn, affects the accuracy of their forecast. Easterwood and Nutt (1999) examine whether analysts (1) systematically underreact to new earnings information, (2) systematically overreact to new earnings information, or (3) systematically optimistic in their reactions. By examining the nature of the information and the type of reaction, the authors find that analysts generally underreact to negative information and overreact to positive information. The study finds that forecast errors are upwardly biased, which may suggest that analysts reflect relevant information inaccurately and systematic optimism in response to new information.

Additionally, Daniel et al. (1998) also rely on the psychology literature and propose a theory based on investor overconfidence and self-attribution bias. This research suggests that investors are usually overconfident in the sense that they believe too strongly in their own private information and/or overestimate their own ability. A strong belief in their own ability is likely to prevent them from realistically estimating their error variance in making predictions and rely too much on their own forecasts. Any new information that confirms their prior belief is likely to aggravate this situation, whereas new information which contradicts their prior belief is likely to have a lesser impact.

Finally, Hong and Stein (1999) consider a market consisting of two types of participants to account for under- and overreaction, namely, news watchers and momentum traders, and both participants are able to process only a subset of publicly available information. On the one hand, the news watchers make forecasts based on signals that they observe privately about future fundamentals, and their limitation being that they do not rely on current or past prices. On the other hand, momentum traders rely on past price changes, their limitation being that their forecasts must be univariate function of the past prices (Hong and Stein, 1999). The authors argue that news watchers rely too much on their own information set and fail to take into account the information of other news watchers and, therefore, this information is slow to fully diffuse throughout the market, leading to short-term underreactions. This also suggests that momentum traders may benefit from trend chasing, which can lead to overreactions in the long run.

Another strand of literature has examined the effect of analysts and their firm characteristics on forecast accuracy and bias. Jacob et al. (1999) examine the factors that influence the forecasts of sell-side analysts and find that analyst aptitude and brokerage house characteristics are both associated with forecast accuracy. Analysts experience is positively associated with forecast accuracy only when the authors do not control for analysts' company-specific aptitude. Jacob et al. (1999) also find that industry specialisation may allow analysts to develop a depth of understanding that can be beneficial when forecasting for companies within that industry, resulting in greater forecast accuracy. Their findings suggest that following companies in unrelated industries can increase task complexity and decreases the accuracy of the estimates.

Furthermore, Clement (1999) also finds that analysts' forecast accuracy is positively related to their experience and the size of their employer but negatively related to the number of firms and industries they follow. Analysts belonging to larger and more prestigious brokerage houses may be highly regarded (Hong and Kubik, 2003) and receive greater incentives to provide accurate forecasts. This is in line with the findings of Jacob et al. (1999) suggesting that forecast accuracy is positively associated with brokerage house industry specialisation and negatively associated with brokerage house turnover.

Prior studies that have examined the factors that may explain the differences in forecasts issued by analysts include Stickel (1992) who finds that the forecasts of top-ranked analysts are more accurate than the forecasts of analysts with lower ranking. Furthermore, top-ranked analysts have larger impact on stock prices than low-ranked analysts. This suggests that top-ranked analysts have superior forecasting ability and have more significant influence over market participants. In this case, the dispersion in forecasts issued by both lower-ranked analysts and top-ranked may be due to the superior forecasting ability of the latter.

Further empirical research have provided evidence suggesting that more sophisticated analysts provide more accurate forecasts (Leone and Wu, 2007). For example, Leone and Wu (2007) find that ranked analysts are consistently able to make more accurate forecasts due to their superior ability and are more likely to be recognised as leaders by other analysts. Additionally, more sophisticated analysts may work for large brokerage firms and have access to greater resources (Clement, 1999) as well as have their compensation linked to their ranking and reputation (Stickel, 1992).

4.2.2. Forecast Consistency and Dispersion

It is argued that dispersion in earnings forecasts reflects uncertainty about firms' future cash flows and the lack of consensus among analysts about future events (Barry and Jennings, 1992; Barron et al., 1998). A key factor of dispersion in forecasts and the uncertainty about future economic performance is the absence of information about firms' segments (Swaminathan, 1991). For example, Swaminathan (1991) finds that dispersion in forecasts is negatively related to the amount of segment level information disclosed by the firm. This suggests that, in the absence of segmental information, uncertainty about future performance of segments leads to wider disagreement about the firm's future performance.

Barron and Stuerke (1998) find a positive relationship between dispersion in forecasts and demand for more information by investors as well as the volatility in price around the earnings announcement. In particular, the study examines the dispersion in earnings forecast issued shortly after the earnings announcements as well as the analysts' activity in generating and disseminating information up to the next announcement period. The study shows that dispersion in analysts' forecast is high after announcements and there is the desire to obtain more information about the firm before the next earnings announcement.

Johnson (2004) suggests that dispersion in analysts' forecasts is likely to indicate nonsystematic risk relating to the unobservability of a firm's underlying value. Additionally, Deither et al. (2002) find a negative relationship between dispersion and stock returns. The authors argue that firms that have higher dispersion in earnings forecast perform worse compared with firms that have low dispersion.

More recently, Hilary and Hsu (2013) find that analysts who have more consistent forecast errors have a greater ability to affect security prices than those who are less consistent. This study suggests that the usefulness of analysts' forecasts should be based on how consistent their forecasts are rather than on the accuracy. The authors argue that whilst investors should take into account the accuracy of forecasts, they should actually place more weight upon forecasts by more consistent analysts.

Hilary and Hsu (2013) argue that if investors are Bayesian, then forecast usefulness should be based on the extent to which an analyst delivers consistent forecast errors instead of accuracy. For example, consider two analysts in the market providing earnings forecasts to external market participants: *Analyst A* and *Analyst B*. *Analyst A* delivers forecasts which are consistently lower than the actual by a constant amount, whereas *Analyst B* provides closer forecasts, but these can be either above or below the actual reported earnings. In this case, investors should pay more attention to *Analyst A* and should place more weight upon forecasts made by this analyst when formulating expectations since forecasts made by *Analyst A* are more predictable than those made by *Analyst B*. Sophisticated investors are more easily able to "de-bias" any information they receive from consistent analysts.

However, if consistency is more important than the accuracy of the forecasts, then analysts may intentionally issue under- or overoptimistic forecasts to maintain their consistency at the expense of accuracy. In line with this theory, Jackson (2005) argues that analysts can also intentionally issue optimistic forecasts in order to satisfy firms' management and gain better access to private information. In addition to this, firms' management may also publicly disclose their future earnings expectations that may facilitate analysts' predictions.

For example, Hilary, Hsu and Wang (2013) examine the accuracy and consistency of management forecasts and find that managers who make consistent forecasting errors have a greater ability to influence investor reactions and analyst revisions. In relation to this, Yang (2012) also finds that managers who issue more accurate earnings forecasts have a greater influence over analysts. They argue that forecast news is likely to have a significantly larger impact on stock price when information asymmetry between internal and external markets is high.

4.3. Buy/Sell Recommendations

Womack (1996) argues that analysts' main objective is to make timely buy/sell recommendations and earnings forecasts are not their primary task. Analysts issue buy/sell recommendations which can indicate whether current stock price is incorrect and may help investors to make profitable trading strategies or investment decisions. For example, Green (2006) reports that buying/selling stock quickly following analysts' recommendations to upgrade (downgrade) results in an average two-day return of 1.02% (1.50%). The study finds that opportunities to generate profit in the short term are greater during the two hour window after the release of analysts' pre-market recommendations. This suggests that brokerage houses are able to provide investors with considerable opportunities to generate profit.

Womack (1996) also finds that the frequency of analysts' buy recommendations is 7 times higher that their sell recommendations. This is in line with prior empirical findings of overoptimism and suggesting that the costs associated with issuing sell recommendation are greater than the costs associated with issuing buy recommendations (Barber et al., 2004; Bradshaw et al., 2006). Furthermore, other studies have suggested that market participants react immediately to recommendations (Kim, Lin and Slovin, 1997), which appear to have a permanent effect.

Barber, Lehavy, and Trueman (2004) find that independent research analysts tend to outperform analysts employed by investment banks. They also find that a major factor of underperformance of analysts affiliated with investment banks is their reluctance to downgrade stocks that had recently issued equity. This is because, on the one hand, analysts may want to produce accurate reports to satisfy investors, but on the other hand, analysts have an incentive to produce positive reports to generate (or retain) investment banking business from the companies being evaluated. Conrad et al. (2006) also finds that changes are “sticky” in one direction and that analysts are more reluctant to downgrade stocks.

Additionally, Conrad et al. (2006) find that analysts are more likely to alter their recommendations after large stock price changes, with the probability that analysts will make their recommendations higher if a large stock price event occurred in the preceding three days. A large decline in stock prices is likely to lead analysts to downgrade rather than upgrade the stock, which is likely to shatter their optimism. Furthermore, the study finds that, in general, the presence of a historical investment banking relationship leads to upgrades rather than downgrades of stock. Finally, analysts also tend to respond in the same manner as other analysts who recently changed their recommendations, thus herding towards a consensus.

To add to this, Bradshaw (2004) examines the link between analysts’ forecasts and stock recommendations, arguing that if the purpose of analysts' recommendations is to advise the purchase/sale of stocks when the price is low/high compared to their estimate of intrinsic value, then recommendations should be related to value estimates based on their earnings forecasts. This is because the earnings forecasts are likely to be used to estimate the stock's value, which is then compared with the actual market price of the stock to determine whether it is under or overvalued. The results indicate that there is little evidence to show that analysts' recommendations can be explained by the residual income valuations but that there is strong evidence that both the price/earnings growth model and the long term growth model explain analysts' recommendations. The findings suggest that analysts do not incorporate their earnings forecasts into their stock recommendations, instead relying on valuation models.

In addition to providing earnings forecasts and making stock recommendations, analysts also provide a number of other outputs, such as written company and industry reports and phone calls to buy-side clients. Although the quality of these output are much more difficult to assess than those of earnings forecasts, buy-side analysts value them as much as stock selections and earnings forecasts (Leone and Wu, 2007). Frequent forecasts can reflect more timely communication with investors, which is viewed as an important aspect of performance by external market participants (Stickel, 1992). Greater stock coverage can contribute to broader industry knowledge, which is also valued by buy-side clients.

4.4. Forecast Errors and Information Complexity

Prior empirical studies find that firm complexity is negatively related to the accuracy of estimates issued by analysts (e.g. Duru and Reeb, 2002). Also, Cukierman and Givoly (1982) find that the dispersion in forecasts increases as the variance of information observations increases. Similarly, Brown et al. (1987) document that analysts' earnings forecast accuracy is positively related to the dimensionality of the information set (firm size used as a proxy) and negatively related to both the variance of information observations and the correlation between the information variables. The three proxies used for information variables are (i) firm size, (ii) prior dispersion in analysts' forecasts and (iii) the number of lines of business of the firm. For example, if *n* is the number of information sources available to analysts and *m* represents the different lines of business, and if *m* is small, then *n* information signals will be highly correlated. On the other hand, if *m* is large, then each of the *n* information signals will tend to represent more diverse types of information.

Further evidence on information complexity and analysts' forecast accuracy is provided by Plumlee (2003), who finds that errors made when forecasting effective tax rates increases as tax law becomes more complex. These results suggest that greater information complexity reduces analysts' use of the information; analysts formulate less complex information to a greater extent and more complex information to a lesser extent. An alternative explanation is that if only a handful of companies are affected by the change in tax rates, then analysts may choose not to invest too much time analysing the potential impact.

Duru and Reeb (2002) examine the relationship between the level of diversification and earnings forecast accuracy, and find that forecast accuracy is negatively related to geographical diversification. As firms become more geographically diversified, their operations become more complex and, hence, the accuracy of the forecasts decreases. Analysts tend to be more optimistic about performance of the firm that is well diversified and presumed to be more complex. Similarly, Lim (2001) provides further evidence that analysts' earnings forecasts are more optimistically biased for firms with less predictable earnings. Duru and Reeb (2002) document that the US firms have expanded significantly within their home country as well as abroad over the past decade and this has led to the development in financial reporting regulation on segments, which has increased the level of information about the firm available to external market participants.

Although all publicly traded firms must meet the minimum disclosure requirements set by the regulators, firms can vary substantially in terms of the amount of additional information they provide to the capital markets. O'Brien and Bhushan (1990) find that analysts follow more firms in industries with stringent reporting requirements. Similarly, Lang and Lundholm (1996) provide evidence that suggests firms with more informative disclosure policies have (i) a larger analyst following, (ii) more accurate analyst earnings forecasts, (iii) less dispersion among individual analyst forecasts and (iv) less volatility in forecast revisions. These findings suggest that the level of information disclosed by companies is an important determinant of the number of analysts following the firm. In addition, an increase in accuracy due to an increased level of information available to market participants suggests that more stringent reporting environments are positively related to forecast accuracy.

Furthermore, Atiase (1985) focuses on specific firm characteristics and argues that the amount of unexpected information conveyed to the market by analysts' reports should be negatively related to firm size. This is based on the notion that firm size is positively related to the amount of information available in the market. The findings suggest that, firstly, the average price revaluation within the first week following the earnings report is significantly greater than the average security price revaluations over the entire other estimation period. Secondly, the level of a price revaluation in response to firms' second-quarter earnings report is negatively related to the size of the firm. This suggests that the differential level of price revaluation can be attributed to the different level of information available for different firm characteristics.

Barry and Brown (1984) examine the effect of firm size on differential information. Based on information availability, larger firms that are likely to make more information available to market participants are considered to be less risky than smaller firms that make less information available. These findings indicate that the perceived risk is negatively related to level of information available about securities that have the same historical beta. Additionally, Freeman (1987) shows that the security prices of large firms reflect reported earnings quicker than the security prices of small firms. However, the level of abnormal returns during the months surrounding a given level of a change in earnings is inversely related to firm size.

4.5. Forecast Errors and External Financing

Bradshaw et al. (2006) examine firms' financing activities and earnings forecasts errors and find that analysts are generally overoptimistic in their forecasts when firms raise external finance by issuing debt or equity. In addition, examining short- and long-term forecasts and stock returns, the study finds a strong negative relationship between net external financing and future stock returns. This result is in line with the theory that firms issue new securities when they are overvalued. This suggest that there is a negative relationship between net external financing and future profitability in both equity and debt financing, more so in the former.

These findings suggest that, on the one hand, a positive relationship between corporate financing activities and optimism in earnings forecasts may indicate that firms have good investment opportunities. On the other hand, it may indicate the presence of conflicts of interest as analysts tend to issue more optimistic forecasts to satisfy firms' management and, in turn, generate trading commissions related to issuing new securities. Bradshaw et al. (2006) find that external financing activity dominates investment banking affiliation and it is a significant determinant of optimism. These findings are consistent with optimism in short- and long-term earnings forecasts, buy/sell recommendations and target prices.

Furthermore, Bradshaw et al. (2006) find that firms that are more involved in issuing new securities have 1-year (2-year) ahead earnings forecast errors that are 1.7 (2.2) times as optimistic as those of firms that are less involved in issuing new securities. In addition to this, for debt financing, the level of optimism is more pronounced in short-term earnings forecasts, whereas, for equity financing this optimism extends to long-term earnings growth forecasts, buy/sell recommendations and target prices. In this study, the short term forecast errors are computed as the realised annual earnings per share for the upcoming year minus the corresponding monthly consensus forecast of this amount, all scaled by stock price as of the end of the forecast month. Similarly, the long-term earnings growth forecast error is computed as the realised long-term earnings growth rate minus monthly consensus forecast growth rate. The realised earnings growth is computed from the slope coefficient of an ordinary least squares regression of the natural logarithm of annual earnings per share on a time trend.

As these findings suggest, conflicts of interest can have a significant impact on the accuracy of analysts' forecasts (Ritter, 2003; Bradshaw et al., 2006). On the downside, external financing can be costly for firms due to the presence of an intermediary, such as an investment bank, which may charge a fee or gross spread for its services. On the upside, Lummer and McConnell (1989) show that banks help transmit more information in capital markets and may help to reduce information asymmetry between internal and external markets. The information asymmetry is generally taken as the standard deviation of a time series of abnormal returns to quarterly announcements. In contrast, Billett et al. (2001) show that there is no difference between bank borrowings compared to equity and debt issues. The study reports that bank borrowers had operating performance below their peers a year before their loan announcement and that their performance did not improve in the three years subsequent to issuing the loan.

Prior empirical studies have also examined the accuracy of analysts' forecasts when (i) a firm that is already publicly listed issues new securities (seasoned equity offering) and (ii) a firm issues securities for the first time (initial public offering). Issuing securities can generate significant business in terms of trading commissions for investment banks. From the viewpoint of the issuing firm, in addition to the direct costs of issuing securities, an issuing firm that is already publicly traded can also end up paying additional indirect costs through the revaluation of its existing securities. This is also known as the announcement effect (Ritter, 2003). These indirect costs may be much larger than the direct costs and generate significant business for banks.

For this reason, the Myers and Majluf (1984) argue that management are likely to issue securities when they are most overvalued. Assuming that management want to maximise the wealth of its existing shareholders in the long run, then they will issue securities when they believe that the current market price is too high. The firm is unlikely to issue undervalued stock because doing so dilutes the fractional ownership of existing shareholders. External market participants who are aware of this decision making process can interpret an equity issue announcement as management being of the opinion that the stock is overvalued, leading to a fall in stock price.

Adding to this, financial analysts' research reports are likely to be of significant importance to investors and their role has been documented as a marketing campaign playing a key role in ensuring new issues are placed successfully (Ritter, 2003). Rajan and Servaes (1997) examine whether analysts make systematic forecast errors in their research reports for firms undertaking the IPO and whether optimism is related to the number of IPOs coming to the market. Their study finds that underpriced IPOs attract larger analyst following, and analysts systematically overestimate the earnings of these companies, where the forecast error is around 5 percent of the firm's stock price on average.

Furthermore, Rajan and Servaes (1997) find that IPOs coming to the market from high growth industries are positively related to optimism in analysts' long-term growth forecasts. Also, Rajan and Servaes (1995) present evidence suggesting that more firms conduct IPOs when seasoned firms in their industries are trading at high multiples relative to the stock market and historical levels. However, firms with the highest long-term growth projections appear to significantly underperform. It could be that firms come to the market when similar firms in their industry are trading at a significant premium but then fail to perform as expected (Jain and Kini, 1994; Mikkelson and Shah, 1994) or analysts are overoptimistic about their future performance.

4.6. Forecast Errors and Internal Financing

In this section, we derive a set of hypotheses from the literature on internal capital markets and analysts' earnings forecast errors. In particular, we build on the literature that examines the link between firm complexity and earnings forecast errors. Our main objective is to determine the relationship between the operations and efficiency of internal capital markets and analysts' earnings forecast errors.

4.6.1. ICM Operations and Forecast Errors

A key distinction between focused firms and multi-segment firms is the presence of internal capital markets in the latter (Shin and Stulz, 1998; Stein, 1997, 2003). As discussed in Chapter 2, internal capital markets can allow diversified firms to finance investments of a segment using cash flow of other segments within the firm and, thus, allow them to make decisions that may not be available to single-segment firms due to financial constraints e.g.

external capital becoming more expensive or unavailable during a financial crisis (Kuppuswamy and Villalonga, 2010; Hovakimian, 2011). Therefore, the financing and investment decisions of multi-segment firms may differ significantly from those of focused firms.

It is now acknowledged that firm complexity is negatively related to analysts' earnings forecast accuracy (Lang and Lundholm, 1996; Clement, 1999; Duru and Reeb, 2002; Plumlee, 2003). For example, diversified firms that operate multiple segments in different industries/countries tend to have lower forecast accuracy (Duru and Reeb, 2002). However, the literature on the determinant of complexity that is presumed with diversified firms and what it is about those diversified firms that increase informational task complexity is limited (Ramnath et al., 2008).

Our first objective is to determine whether the operation of internal capital markets within diversified firms are related to the earnings forecast errors. This is because intra-segmental capital allocations within multi-segment firms are likely to increase the complexity surrounding the evaluation of the firms' future profitability for at least two reasons. First, unlike equity and debt finance, internal capital reallocation decisions do not require such detailed disclosure of information to external market participants. Therefore, it is difficult to identify which segments are being allocated more resources within the firm. Second, segments' investment opportunities are more difficult to determine and, hence, the efficiency of internal capital markets may be more difficult to establish.[11]

Diversified firms have the ability to operate internal capital markets and engage in cross-subsidisation of capital resources which may not be visible to market participants. For

[11] As discussed in Chapter 2, segments of a conglomerate are not separately listed, and there is limited publicly available information. Therefore, it's difficult to obtain a market value and investment opportunities of a particular segment.

example, the firm may be able to finance investment opportunities of a segment using cash flow of other segments within the firm (Shin and Stulz, 1998). This option is not available to single segment firms as these firms do not operate internal capital markets (Kuppuswamy and Villalonga, 2010). Furthermore, segments of a diversified firm are not usually separately listed on an exchange, which makes it more difficult to determine the value of a segment and assess its investment opportunities due to limited publicly available information (Shin and Stulz, 1998; Park, Lee and Shin, 2008; Gugler et al., 2013).

Thus, internal capital markets may add to the difficultly of the task of determining the future profitability of the firm because information about the projects that are financed is limited and not fully disclosed to external market participants. Also, the size of intra-segmental capital resources allocations or the managers' assessment on segments' investment opportunities is not usually disclosed. Therefore, we argue that limited information about firms' internal capital markets can add to the complexity of the task of forecasting. Our first hypothesis is as follows:

Hypothesis 2.1: Internal capital markets operations are negatively related to analysts' earnings forecast accuracy.

In addition to this, prior literature suggests that the level of optimism in analysts' earnings forecasts is positively related to the complexity of the task (e.g. Plumlee, 2003). This study argues that analysts pay more attention to less complex information and less attention to more complex information. In line with this, Duru and Reeb (2002) document that analysts tend to be more optimistic about firms' performance that is well diversified and presumed to be more complex. Similarly, Lim (2001) find evidence that suggests analysts' earnings forecasts are more optimistically biased for firms with less predictable earnings.

If internal capital markets aggravates firm complexity, then analysts are likely to be more optimistic about the future performance of firms that operate larger internal capital markets (Duru and Reeb, 2002; Plumlee, 2003). Prior literature suggests that internal capital markets are successful at financing investment opportunities of a segment using capital resources of other segments within the firm (Shin and Stulz, 1998; Rajan et al., 2000) and, therefore, are able to make decisions that are not available to single segment firms (Kuppuswamy and Villalonga, 2010).

If analysts consider internal capital markets operations to be value-enhancing, then the extent of internal capital markets operations are likely to be related to more optimistic forecasts. On the other hand, if internal capital market operations of firms are considered to be inefficient, then analysts are less likely to issue optimistic forecasts. Therefore, our next hypothesis is as follows:

Hypothesis 2.2: Internal capital markets operations are positively related to Bias in earnings forecasts.

Prior literature suggests that, on the one hand, analysts may demand more segment level information and value the increased transparency between internal and external markets. In line with this, segment level information disclosed by firms is negatively associated with the level of dispersion in earnings forecasts (Swaminathan, 1991) and analyst coverage increases with the level of disclosure. As discussed above, dispersion in forecasts indicates disagreement about the firms' future economic performance and future events among analysts (Barron et al., 1998).

On the other hand, a number of studies suggest that the presence of multiple segments within a firm may reduce accuracy and aggravates dispersion in forecasts (e.g. Duru and Reeb, 2002). Segments of diversified firms are not usually financially independent and, hence, their investment policies can differ significantly from focused firms (Kuppuswamy and Villalonga, 2010). Therefore, this is likely to increase the earnings uncertainty and the future profitability of the firm.

Our objective is to determine whether the extent of internal capital markets operations aggravates information complexity and increase the level of dispersion in earnings forecast issued by analysts. Internal capital markets can enhance or destroy firm value depending on whether they are efficient or inefficient (Rajan et al., 2000). If analysts have different opinions about the value added by internal capital markets, then their estimates are likely to differ. Therefore, our next research question is as follows:

Hypothesis 2.3: Internal capital markets operations are positively related to dispersion in earnings forecasts.

4.6.2. ICM Efficiency and Forecast Errors

Efficient internal capital market theory promotes the use of capital resources to finance good investment projects (Shin and Stulz, 1998) which, in turn, may enhance firm value (Rajan et al., 2000). However, the literature finds that internal capital markets generally operate inefficiently (Shin and Stulz, 1998; Rajan et al., 2000; Scharfstein and Stein, 2000;

Ozbas and Scharfstein, 2010). This suggests that less profitable segments are allocated more resources compared with high profitable segments of the firm. A number of studies document the factors that may lead to inefficient internal capital markets within a firm, e.g. agency costs (Jensen, 1986), socialism (Scharfstein, 1998), rent-seeking (Scharfstein and Stein, 2000), influence activities by division managers (Wulf, 2009).

Therefore, the efficiency of internal capital markets is not only an indicator of how resources are distributed within the firm but are also likely to provide a signal to external market participants about internal working of the firm, e.g. investment policies, the extent of internal problems such as rent-seeking by division managers (Scharfstein and Stein, 2000) and whether resources are misallocated in the presence of free cash flow (Jensen, 1986) indicating failures in internal governance.

The earnings forecasts are more likely to be accurate if analysts are able to determine the efficiency of internal capital markets and incorporate this information into their estimates. This is because the future profitability of the firm can depend on the type of investment projects financed, and amount of capital resources allocated to finance those investment projects. For example, efficient internal capital markets will allocate more resources towards segments which have good investment opportunities and are more profitable.

If analysts believe internal capital markets to be well-functioning from the signals they observe about their efficiency and firms allocate resources efficiently, then their forecasts are likely to be more accurate. Therefore, our next hypothesis is as follows:

Hypothesis 2.4: Internal capital market efficiency is positively related to earnings forecast accuracy.

If analysts consider internal capital markets to be active and efficient, then they are likely to be more optimistic about the future performance of the firm. For example, it is well-documented that efficient internal capital markets can enhance firm value by “winner-picking” investment projects (Stein 1997, 2003; Rajan et al. 2000). If managers are able to allocate resources more efficiently, then the firm is likely to be more profitable in the future.

On the other hand, if resources are misallocated (e.g. through rent-seeking or empire building as documented in prior literature) then internal capital markets are likely to destroy value. Thus, the value-diminishing and more inefficient internal capital markets are likely to be associated with lower optimism in forecasts. Also, if task of determining internal capital markets operations and efficiency are perceived to be complex, then analysts are also likely to be optimistic about a firm’s performance. For example, a number of studies report a positive relationship between firm complexity and an upward bias in earnings forecasts (Lim, 2001; Duru and Reeb, 2002). Therefore, our hypothesis is as follows:

Hypothesis 2.5: Internal capital markets efficiency is positively related to Bias in earnings forecasts.

It has been well-documented that more segment information disclosure is highly valued by analysts (Healy et al., 1999), and that number of analysts following increases when firms disclose more information (Botosan and Harris, 2000). For example, the level of segment information disclosed by firms is positively related to the number of analysts following the firm (Berger and Hann, 2003). Prior studies also find that higher level of information disclosures enables analysts to make more accurate forecast about the future performance of the firm (e.g. Swaminathan, 1991).

In general, this information is particularly valuable because segments of a diversified firm are not usually separately listed on an exchange and, thus, the task of determining firms' future profitability becomes more complex due to lack of publicly available information about these segments. It has been well documented that corporate diversification not only increases firm complexity but can also increase earnings uncertainty (Duru and Reeb, 2002).

If analysts consider internal capital markets to be well-functioning from the signals they observe about their efficiency and firms allocate resources efficiently, then their forecasts are likely to be more accurate. Therefore, there is likely to be less dispersion in earnings forecasts when internal capital markets are efficient. Similarly, there is likely to be more dispersion in earnings forecasts when internal capital markets are inefficient and analysts disagree on the future profitability of the firm. Thus, we expect a negative relationship between the level of efficiency and dispersion in earnings forecasts. Our next research question is as follows:

Hypothesis 2.6: Internal capital markets efficiency is negatively related to the level of dispersion in earnings forecasts.

4.7. Summary

The research reports and forecast estimates issued by analysts play a vital role in capital markets by helping to bridge the information gap between the management of firms and external market participants (Hall and Tacon, 2010; So, 2013). In this chapter, we examined the literature on analysts' earnings forecast errors and their link with internal capital markets. In particular, we examine the literature on three key characteristics of analysts' forecasts, namely, the accuracy, bias and dispersion.

Prior literature has argued that the usefulness of such estimates is of significant importance to investors and market participants only if they are able to accurately forecast the future performance of the firm (Hilary and Hsu, 2013). A number of studies have argued that a key determinant of forecast errors is the complexity of the task (Clement, 1999; Duru and Reeb, 2002). In particular, Duru and Reeb (2002) argue that international diversification increases firm complexity and negatively affects analysts' earnings forecast accuracy.

Our first objective is to determine whether the extent of internal capital market activity aggravates firm complexity and negatively affects forecast accuracy. Unlike focused firms that operate primarily in a single industry, diversified firms usually have segments operating in related as well as unrelated industries and have the ability to operate internal capital marekts (Shin and Stulz, 1998). Unlike raising finance externally, internal capital market operations do not require disclosure of information to external market participants and are not directly observable. To add to this, segments are not usually separately listed on the exchange which makes it difficult to derive their value and investment opportunities.

Prior research finds a positive relationship between information complexity and optimism in forecasts (Lim, 2001; Duru and Reeb, 2002). Plumlee (2003) finds that analysts pay more attention to less complex information and less attention to more complex information. Furthermore, we explore the relationship between earnings forecast errors and the efficiency of internal capital markets, arguing that analysts are likely to be more optimistic about firms that operate efficient internal capital markets. Lastly, we investigate whether the extent of internal capital markets operations lead to a greater dispersion in forecasts. If the presence of internal capital markets increase firm complexity, then analysts are likely to disagree more about firms' future performance.

In Chapter 5, we discuss our data and the sources for our analysis on internal capital markets and analysts' earnings forecasts errors in the UK, France and Germany. We also discuss the method used to examine the operation and efficiency of internal capital markets and present firm- and segment-level descriptive statistics for the three countries.

CHAPTER 5 – DETERMINING INTERNAL CAPITAL MARKETS OPERATIONS AND EFFICIENCY

5.1. Introduction

In this chapter, we describe the sample selection process and the methods used to determine the operation and efficiency of internal capital markets within conglomerates. Prior literature has mainly focused on internal capital markets within two distinct organisational structures, namely, conglomerates and business groups (e.g. Hovakimian, 2011; Lee et al., 2008) using two main methods to determine their operations and efficiency (Shin and Stulz, 1998; Rajan et al., 2000). A key distinction between firms affiliated with business group and segments of diversified firms is that the latter are not usually listed separately on an exchange (Gugler et al., 2013). Segments of diversified firms are usually completely owned by the parent firm and mainly rely on headquarters for finance (Gugler et al., 2013).

Our objective is to examine the operations and efficiency of internal capital markets in conglomerates that operate in two distinct financial systems, namely, market- and bank-based systems. A major obstacle facing prior empirical studies has been the lack of segment level data in the financial reports of public listed companies (Maksimovic and Phillips, 2007). The adoption of the IFRS accounting standards in 2005 in Europe requires public listed companies to disclose more segment level information. Thus, it enables us to provide further evidence on this subject by examining internal capital markets in the UK, France and Germany, as well as allowing us to make cross-country comparisons. We obtain segment and firm level data from Datastream over a six year period.

In Section 5.2, we discuss our process of calculating the operation and efficiency of internal capital markets. In Section 5.3, we examine the segmental reporting requirement of IFRS in Europe. Next, we discuss the data requirements, sources and data filtering process in Section 5.4. We present and discuss basic statistics from the UK, France and Germany in Section 5.5. In Section 5.6, we summarise the chapter.

5.2. Method: Determining Operation and Efficiency

As discussed in Chapter 2, internal capital markets play a key role in the allocation of capital resources within diversified firms. There are two methods put forward in prior literature to determine whether internal capital markets are active and efficient. The first approach put forward by Shin and Stulz (1998) examines the relationship between a segment's investment and cash flow of other segments within the firm. The second approach was put forward by Rajan et al. (2000) and it directly measures the efficiency of internal capital markets through the relative value added model. We discuss each of them in the subsections below.

5.2.1. Investment-Cash Flow Model

It is now a well-documented fact that corporate investment depends on financial factors of the firm, such as equity and debt finance as well as internal finance i.e. cash flow and retained earnings (Fazzari et al., 1988). Lamont (1997) documents that if internal finance has a cost advantage and differs substantially to the cost of external finance, then under these circumstances, investments and financing decisions will be interdependent. Prior research focusing on the investment-cash flow relationship generally use panel data to estimate:

$$\frac{I}{K} = a + b\frac{CASH}{K} + cQ + FirmDummy + YearDummy \tag{5.1}$$

In the above Equation (5.1) the variable *I* is the investment and *K* is the capital stock at beginning of the period. *Cash* is a measure of cash flow which is generally the operating income plus depreciation, and *Q* is Tobin's-Q of the firm. Lastly, *FirmDummy* and *YearDummy* are the firm or industry and time dummy variables respectively. Shin and Stulz (1998) build on the investment-cash flow sensitivity model (Fazzari et al., 1988) by examining the investment-cash flow sensitivity at segment level and introducing the cash flow of other segments as a proxy for resources available for reallocation within the firm.

$$\frac{I}{TA} = a + b\frac{OWN\ CASH}{TA} + c\frac{OTHER\ CASH}{TA} + dQ + \Delta Sales + YearDummy \qquad (5.2)$$

In Equation (5.2), the variable *I* represents a segment's investment and *TA* is the total assets of the firm at beginning of the period. *OWN CASH* is the cash flow of the segment and, *OTHER CASH* is the sum of cash flow of other segments within the firm excluding its own. The variable *Q* is the proxy for Tobin's-Q of the segment. A problem with examining segment level data is that market value of segments is not available and, hence, Q cannot be computed at segment level. Thus, median Q of focused firms operating in the same industry is usually taken as a proxy for a segment Q in the prior literature. Lastly, Δ*Sales* is the growth in sales of the segment at the beginning of the period.

Shin and Stulz (1998) argue that, in the presence of well-functioning internal capital markets, firms should find it easier to protect good investment projects of segments by cross-subsidising resources. For example, a rise in cash flow of a segment should bring about a rise in the resources available for reallocation within the firm and, in turn, increase the level of investment by segments with good opportunities. Therefore, internal capital markets can affect the investment made by a segment either by subsidising or transferring resources between segments. In line with this theory, Lamont (1997) examines the intra-segmental capital allocations within large oil companies and finds that cash flow from oil segments is generally used to subsidise the investments of non-oil segments of the firm.

Efficient internal capital market theory promotes the use of capital resources to finance good investment projects. If internal capital markets are efficient then we expect segments' investment to rise (fall) with an increase (decrease) in its investment opportunities. The idea is that if firms have limited resources and external finance is costly, then internal capital markets should prioritise and allocate more resources to segments with good investment opportunities. However, internal capital markets may fail to add value if capital resources are not allocated efficiently. A number of studies that have examined the efficiency of internal capital markets report that they generally operate inefficiently (Maksimovic and Phillips, 2007).

5.2.2. The Relative Value Added Model

The second approach was introduced by Rajan et al. (2000) which measures the efficiency of intra-segmental capital allocations through the relative value added (RVA) model or the absolute value added (AVA) model. This method has been widely used in the prior literature (e.g. Sautner and Villalonga, 2010; Hovakimian, 2011). As discussed in Chapter 2, the key distinction between RVA and AVA is that the former compares investment opportunities of a segment against investment opportunities of other segments within the firm to measure the efficiency of internal capital markets and, hence, it is mainly used in studies that focus only on diversified firms (Kuppuswamy and Villalonga, 2010).

To construct a measure of the efficiency of a firm's internal capital market, we first look at the difference between the investment rate of a segment that is part of a diversified firm and the investment it would have made had it been a focused firm operating in the same industry. The *industry-adjusted investment* is constructed by taking the difference between the capital expenditure of the segment normalised by total assets and asset weighted average of the same variable for focused firms and segments of diversified firms in the same industry. In Equation (5.3), *j* refers to the segment of the firm and *ss* refers to the single segment firms in the same industry. *I* is the segment investment and *TA* is the total assets of segment/firm.

$$I_j^{ind} = \left[\frac{I_j}{TA_j} - \frac{I_{ss}}{TA_{ss}}\right] \tag{5.3}$$

As a next step, we further adjust this variable by subtracting the weighted average *industry-adjusted investment* for all segments within the firm. This is to control for the possibility that diversified firms might have more funds available than stand-alone firms. For example, Rajan et al. (2000) argues that if we measure transfers and subsidies just by taking the difference between the investment rate of a segment and that of a focused firm in the same industry, we might otherwise treat these additional funds as resources exchanged rather than as additional funds (e.g. obtained via external markets) available to all segments. Therefore, as a next step we obtain the *firm- and industry-adjusted investment*:

$$I_j^{firm-ind} = \left[\frac{I_j}{TA_j} - \frac{I_{ss}}{TA_{ss}}\right] - \sum_{j=1}^{n} w_j \left[\frac{I_j}{TA_j} - \frac{I_{ss}}{TA_{ss}}\right] \tag{5.4}$$

In Equation (5.4), the variable *I* is the investment of segment *j*, *ss* refers to the single segment firm, and *w* is segment *j*'s share of total firm assets. *TA* is the total assets of the firm or segment and *n* is the total number of segments within the firm. This variable was developed by Rajan et al. (2000). If the *firm- and industry-adjusted investment* is positive (negative), then this indicates that a segment's investment being part of a diversified firm is more (less) than the investment it would have made if it was a focused firm. Thus, a positive (negative) value indicates that a segment has more (less) resources to invest as it receives a subsidy (makes a transfer) via internal capital markets. We follow Sautner and Villalonga (2010) to compute the size of an internal capital market of firm *i* at time *t* by taking the sum of the absolute values of transfers and subsidies across all segments of firm *i* in year *t*.[12]

Finally, to construct RVA, we weight the *firm- and industry-adjusted investment* of each segment by the difference between the segment's Tobin's-Q and the asset weighted average Tobin's-Q of all segments in the firm. Next, we add the weighted subsidies and transfers across all segments of firm *i* in year *t* and standardise it by total assets. If this measure is positive i.e. $RVA > 0$, then this indicates that a firm operates an efficient internal capital market, and if $RVA < 0$ then internal capital markets are inefficient i.e. more resources are allocated to segments with below average investment opportunities.

$$RVA = \frac{\sum_{j=1}^{n} TA_j [q_j - \bar{q}] \left[\frac{I_j}{TA_j} - \frac{I_{SS}}{TA_{SS}} - \sum_{j=1}^{n} w_j \left[\frac{I_j}{TA_j} - \frac{I_{SS}}{TA_{SS}}\right]\right]}{TA_i} \tag{5.5}$$

[12] Sautner and Villalonga (2010) take the size of an internal capital market as the sum of subsidies and transfers made by the firm in a particular year. A segment receives a subsidy (makes a transfer) if the *firm- and industry adjusted investment* is positive (negative).

$$Size = \sum Subsidy_j + \left|\sum Transfer_j\right|$$

In Equation (5.5), the variable j refers to the segment and i refers to the firm. The variable Q is the segment Tobin's-Q, and $\bar{q}$ is the asset weighted average Tobin's-Q of all segments within the firm. As discussed above, median Tobin's-Q of focused firms is used as a proxy for segment Tobin's-Q. As an alternative, we also use segment's ROA instead of Tobin's-Q for the construction of the internal capital market efficiency measure.

Our segment-level variables, e.g. Tobin's-Q and the industry average investment rate, are based on a comparison with focused firms operating in the same industry, which we construct by matching the segment of a diversified firm to all focused firms whose primary SIC code is in the same 2-digit SIC group (discussed in Section 5.4.2). In the next section, we discuss Tobin's-Q as a measure of segments' investment opportunities.

5.2.3. Proxy for Segment Opportunities

Determining investment opportunities of segments is essential for identifying whether the transfers of capital resources within a conglomerate are efficient or inefficient. In addition to this, Whited (2002) documents another potential problem associated with not taking into account the investment opportunities of segments when determining the presence of internal capital markets. The study finds that, in the absence of a proxy for investment opportunities in the investment-cash flow model put forward by Shin and Stulz (1998), the cash flow of other segments may appear as a significant explanatory variable for investment in another segment of the firm, not because of active internal capital markets but due to cash flow of one segment being correlated with investment opportunities of the second segment.

Tobin's-Q, which is the ratio of market value to replacement cost, has been widely used in the finance literature (Tobin 1969, 1978; Lindenberg and Ross, 1981; Lang and Stulz, 1994; Shin and Stulz, 1998; Rajan et al. 2000; Lee et al. 2008; Hovakimian, 2011). The basic theory behind the casual relationship between Q and investment is that if marginal Q exceeded unity (i.e. if the value of investment exceeds its cost) then firms would have an incentive to invest. If firms exploited these investment opportunities, then value of Q should head towards unity (Lindenberg and Ross, 1981). Thus, if a firm's Q is greater than one, its market value is in excess of the replacement costs.

Since the market value plays a critical role in determining the value of Q, the main drawback has been that Q cannot be computed for non-listed firms such as segments of diversified firms that are not listed separately on an exchange. For this reason, prior studies examining the relationship between investment and Tobin's-Q at segment level have generally used median Q of focused firms in the same industry as a proxy for investment opportunities of the segment (Shin and Stulz, 1998; Rajan et al., 2000; Sautner and Villalonga, 2010; Kuppuswamy and Villalonga, 2010; Hovakimian, 2011). For example, Shin and Stulz (1998) estimate median Tobin's-Q of focused firms, defined as value of equity plus book value of total assets minus book value of equity all over total assets, and use that as a proxy for segment investment opportunities.

However, a small number of studies have documented that inefficiency of internal capital markets and diversification discount as reported in prior literature may be due to measurement error in Tobin's-Q (Whited, 2002; Erickson and Whited, 2012). This strand of literature suggests that it may not be correct to assume that a segment of a diversified firm will have a median industry Tobin's-Q. To deal with this issue, prior literature has used asset-weighted average Tobin's-Q of focused firms as an alternative to median Tobin's-Q and find that results remain unchanged, arguing that Tobin's-Q is a good proxy of investment opportunities (Rajan et al., 2000).

5.3. Segment Reporting

The adoption of IFRS as issued by the International Accounting Standards Board (IASB) in 2005 resulted in the application of a common set of financial reporting standards within Europe (Armstrong et al., 2010). Prior to the year 2005, most European firms applied domestic accounting standards and the adoption of IFRS represented one of the largest financial reporting changes in recent years (Armstrong et al., 2010). The IFRS 8 on Operating Segments, which replaced the IAS 14 Segment Reporting,[13] requires publicly listed firms to disclose information about their operating segments, products and services, the geographical areas in which they operate, and their major customers. This information is based on internal management reports, both in the identification of operating segments and measurement of disclosed segment information.

The IFRS 8 requires firms to report financial and descriptive information about its reportable segments. First, firms must report information on the segment if the reported revenue, from both external customers and intersegment sales or transfers, is 10 percent or more of the combined revenue of all operating segments. Second, if the absolute measure of its reported profit or loss is 10 percent or more of the greater, in absolute amount, of (i) the combined reported profit of all operating segments that did not report a loss and (ii) the combined reported loss of all operating segments that reported a loss. Third, its assets are 10 percent or more of the combined assets of all operating segments. If the total external revenue reported by operating segments constitutes less than 75 percent of the entity's revenue, additional operating segments must be identified as reportable segments (even if they do not

[13] The IFRS came into effect from January 2005, and required firms to disclose segment level information. IFRS 8 Operating Segments replaced IAS 14 Segment Reporting in 2009. The measurement of key segment data items has not changed significantly under IFRS 8 and IAS 14, and unlikely to have an impact on our findings. For a review of the accounting standards see: http://www.iasplus.com/en/standards/ifrs/ifrs8.

meet the quantitative thresholds set out above) until at least 75 percent of the entity's revenue is included in reportable segments.

Other required disclosures include general information about how the entity identified its operating segments and the types of products and services from which each operating segment derives its revenues. An explanation of the measurements of segment profit or loss, segment assets and segment liabilities, including certain minimum disclosures, e.g. how transactions between segments are measured, the nature of measurement differences between segment information and other information may also be included in the financial statements. For single segment firms, there exist entity-wide disclosures that are required even when an entity has only one reportable segment, including information about each product and service or groups of products and services. Firms may voluntarily disclose even more information than required by law and reduce information asymmetries and, in turn, gain access to inexpensive capital; however, this usually means exchange of transparency about their situation and operations (Veron, 2007).

Segment level information enables market participants to understand corporate business models and the risks, value potential of different lines and synergies or inefficiencies that may make the group more or less valuable than portfolio of comparable single segment firms (Berger and Ofek, 1995; Lins and Sarvaes, 1999; Veron, 2007). This becomes particularly important when firms are large and highly complex with segments operating in related as well as unrelated industries.

The disclosure of segmental information has enabled market participants to understand the core working of the internal capital markets within the firm (Shin and Stulz, 1998; Rajan et al., 2000; Stein, 2003; Maksimovic and Phillips, 2007). As segments are not financially independent, researchers have relied on the segment information provided by the firm to be able to investigate the similarities and differences in investment policies of diversified and focused firms.

5.4. Data Sources and Main Items

In this section, we describe the sample selection process and the data for our empirical analysis. Our study on internal capital markets focuses on diversified firms that are domiciled and publicly listed in the UK, France and Germany between 2005 and 2010. As discussed in prior section, the adoption of the IFRS in the year 2005 required public listed companies in Europe to disclose more segment level information, however, the availability of segment level data prior to 2005 is severely limited in Datastream. Thus, we take the year 2005 as the starting point for the analysis to minimise the problem of missing data.

We begin by obtaining a list of firms for each year whose securities are publicly traded in the UK, France and Germany between 2005 and 2010 from Datastream. In particular, we focus on firms whose primary exchange is London Stock Exchange, Euronext Paris or Frankfurt Stock Exchange. We do this for two reasons. First, our focus is on diversified firms whose home or domiciled country is the UK, France or Germany. Second, this ensures that cross-listed firms are not represented twice in our sample.

Additionally, we collect analysts' forecast information for our list of firms. Analysts from investment research departments worldwide contribute estimates and recommendations to Thomson Financial I/B/E/S (Institutional Brokers' Estimate System) database. These databases provide global current and historical earnings information. Historical data are available at company summary and global aggregate levels. We obtain information on analysts' earnings forecasts for our list of firms from I/B/E/S.

Table 5.1

Main data items and source.

	Description	Source	Time Period	Diversified / Single segment firm	Firm/ segment level data
Total Assets	This is the total current assets reported by the firm/segment.	Datastream	2004 – 2010	All firms	Both
Sales/Revenues	This represents gross sales and other operating revenue.	Datastream	2003 – 2010	Diversified firms	Segment
Capital Expenditure	The funds used to acquire fixed assets.	Datastream	2005 – 2010	All firms	Segment
SIC Code	The standard industry classification which covers the economic activities of firm/segment.	Datastream	2003 – 2010	All firms	Both
Operating Income	Operating income is the difference between sales and total operating expenses.	Datastream	2005 – 2010	Diversified firms	Segment
Depreciation	This represents the cost of a depreciable asset to the accounting periods covered during its expected useful life to a business.	Datastream	2005 – 2010	Diversified firms	Segment
EBITDA	This is the earnings of a company before interest expense, income taxes and depreciation.	Datastream	2005 – 2010	All firms	Both
Market capitalisation	This represents the total market value of the company.	Datastream	2004 – 2010	All firms	Firm
Common Equity	It is the common shareholders' investment in a company.	Datastream	2004 – 2010	All firms	Firm
Long-term Debt	This represents all interest bearing financial obligations, excluding any amounts due within one year.	Datastream	2005 – 2010	All firms	Firm
Short-term debt	Short-term debt represents the portion of debt payable within one year.	Datastream	2005 – 2010	All firms	Firm
Earnings per share – mean one year forecast	This is the average of all the earnings per share forecasts supplied by analysts for the current financial year of the company, that is, the financial year not yet reported.	I/B/E/S	2005 – 2013	All firms	Firm
Earnings per share – mean two year forecast	This is the average of all the earnings per share forecasts supplied by analysts for the next financial year of the company. The next financial year is defined as that following the current year.	I/B/E/S	2005 – 2013	All firms	Firm

Earnings per share – forecast standard deviation	Standard deviation of the earnings estimates supplied by analysts.	I/B/E/S	2005 – 2013	All firms	Firm
Earnings growth – mean long-term forecast	This is the average of all long term growth estimates supplied by analysts. It is usually the growth rate in earnings over a five year period.	I/B/E/S	2005 – 2013	All firms	Firm

This table shows the key data items obtained from Datastream and I/B/E/S for our sample of firms in the UK, France and Germany. The time period for our analysis on internal capital markets is between 2005 and 2010. We require monthly earnings forecast information to be available between 2005 and 2013. Datastream provides information on 10 Product Segments of the firm; we obtain this information for our sample of firms. In addition to the analysts forecast information shown in the table, we also obtain Min, Max, Mean, Median, Number of Analysts and the Standard Deviation of forecasts.

5.4.1. Data Filtering and Analysis

The initial list from Datastream contained 13,754, 5,045 and 7,104 firm-years between 2005 and 2010 in the UK, France and Germany, respectively. The initial list includes both diversified and focused firms. As a first step, we identify diversified firms by counting the number of segments reported by the firm. For example, Product Segment information is given for up to ten segments of a company in Datastream. If a company has only one product line data, then only Segment 1 is updated. If a company has more than ten segments the remaining segments are included with the Product Segment 10 data. We classify a firm as diversified if it reports 2 or more segments, and focused otherwise.

Next, we exclude financial firms and firms with segments in financial industry, identified by SIC code 6000 to 6999. We exclude financial firms because these firms tend to have much higher leverage and increased sensitivity to financial risk (Foerster and Sapp, 2004). For example, high leverage of financial firms may not indicate the "distress" associated with high leverage of non-financial firms which could bias the results from the analysis. This is a standard procedure in the literature to exclude financial firms (Shin and Stulz, 1998; Hovakimian, 2011). Studies focusing specifically on financial firms generally find evidence in line with active internal capital markets (Cremers, Huang, Sautner, 2009).

Our primary objective is to examine the operation and efficiency of internal capital markets within diversified firms. Hence, the primary variable in our analysis is the capital expenditure of segments. As a first step, we identify and exclude firms that have not reported the segment capital expenditure or it is missing for a reported segment. This is because the investment level will enable us to examine the interdependence of segment investment and resources within the firm.

Secondly, we identify and exclude firms that do not report or have missing total assets at segment and firm level. The asset base of the segment allows us to determine its size relative to other segments and the firm. As defined in section 5.3, we require the segment and firm assets at *t-1* to compute ratio of investment to total assets as well as cash flow to total assets. Therefore, we do not include any firm in our analysis that does not provide total firm/segment assets.

Third, our model includes growth in sales of a segment as a control variable for its profitability. We require sales growth of a segment to be available at the beginning of the period, calculated as sales (*t-1*) minus sales (*t-2*) divided by sales (*t-2*). For example, to determine the profitability of a segment at the beginning of 2005 we require segment sales to be available at 2003 and 2004. We identify and exclude firms from our analysis that have missing sales growth figures.

As discussed in Section 5.3, our objective is to determine the sensitivity of segment investment and firms' internal resources i.e. the sum of cash flow of all other segments within the firm. The cash flow is calculated as operating income plus depreciation (Shin and Stulz, 1998). Therefore, we identify and exclude firms that do not report or have missing operating income. The cash flow of a segment as well as cash flow other segments is of significant importance as we establish whether internal capital markets enable the cross-subsidisation of resources within multi-segment firms.

Lastly, our analysis requires the construction of industry adjusted variables and, thus, matching of a segment to its single segment firms in the same industry. We require that firms report segment and firm SIC codes. Otherwise, we exclude the firm from the analysis as we are unable to compute a proxy for investment opportunities and industry adjusted investments. We match the segment to focused firms in the same industry by converting the reported four-digit SIC code to the two-digit SIC code. The construction of the two-digit SIC code is discussed in Section 5.4.2.

Additionally, our measure of segment investment opportunities is based on beginning of the year median Tobin's-Q of focused firms. Tobin's-Q is calculated as value of equity plus book value of total assets minus book value of equity all over total assets (Shin and Stulz, 1998). Therefore, we only include firms in our analysis that have segments with at least three focused firms operating in the same industry. We require focused firms to have market capitalisation, shareholders' equity and total assets available. We exclude the firm from the analysis if any of these data items are not reported or missing. Further, to determine the industry average investment we require focused firms to have capital expenditure available, and exclude the firm from the analysis otherwise.

Unlike prior studies which exclude firms that have only related segments because the investment opportunities are the same (e.g. Hovakimian 2011), we include firms that operate unrelated as well as related segments in our analysis. This is because, a number of studies have observed that firms become more efficient when they increase focus i.e. operate in related industries (see, e.g., Berger and Ofek, 1995; Comment and Jarrell, 1995; John and Ofek, 1995). We follow Rajan et al. (2000) to compute the asset-weighted investment opportunities of segments and, thus, we examine whether the distribution of segment size as well as the investment opportunities affect the capital allocation process.

Table 5.2

Data Filtering.

	UK	France	Germany
Initial Firm List	13,754	5,045	7,104
Diversified Firms	4,621	2,830	3,347
Capex and Total Assets	2,552	1,017	1,824
Sales	2,493	988	1,742
Operating Income	2,478	985	1,738
Financial Firms/Segments	2,010	885	1,408
Panel A			
Final Sample			
Firm-Years	2,010	885	1,408
Number of Firms	530	207	311

This table shows the sample selection process and the number of firms in our study on internal capital markets. We include three countries in our analysis, namely, the UK, France and Germany. The time period is between 2005 and 2010. The number of firm-years at the beginning of the process and after applying the key restriction is shown for the three countries in our analysis. Panel A shows the final sample of diversified firms for the three countries.

5.4.2. Industry Classification

As discussed above, the industry estimates for segments in our analysis are based on the average/median values of focused firms operating in the same industry. To begin, we obtain the list of 48 industry portfolios from French's website.[14] Fama and French (1997) start from firms' 4-digit SIC codes and restructure them into 48 industry portfolios. Similarly, we convert firm and segment 4-digit SIC code into a 2-digit SIC code using the list, and then match segments of diversified firms with focused firms operating in the same industry at the 2-digit SIC level.

The Fama-French (FF) industry classification has been widely used in many academic studies in asset pricing, corporate finance, accounting and economics (for a review of these studies see, Chan et al., 2007). In general, studies on internal capital markets usually match segments and focused firms at the 3- or 2-digit SIC level (Sautner and Villalonga, 2010; Hovakimian, 2011). The motivation behind using 3- or 2-digit SIC level is to maximise the number of segments matched with focused firms in their industry. To be able to compute average or median values, we require at least three focused firms in the same industry.

5.4.3. Adjustment of Monetary Values

The data we obtain over a six year period are reported in local currency in which the firm operates, i.e. Euros and Pound Sterling. To be able to make a comparison between firms in three countries, the monetary values reported in our descriptive tables are in a common currency and base year, namely, the Euro (2005). To do this, we start by converting monetary values reported in a particular year to their equivalent value with 2005 as the base year. As a

[14] The 48 industry portfolios are obtained from French's website:
http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/Data_Library/det_48_ind_port.html

next step, we convert all GBP values to Euros using the exchange rate in that year. We use the exchange rate that corresponds to the firms' fiscal year-end month i.e. if a firm has year-end month as December, then we use the end-of-month exchange rate for December.

For example, consider a UK based firm that releases its financial statements in December 2009 and the reporting currency is GBP. We start by adjusting the reported monetary values by using 2005 as the base year with the GDP deflator series, and then convert them into Euros using December 2005 exchange rate. Similarly, consider a firm based in Germany that releases its financial statements in March 2008. As the reporting currency is Euros, we only adjust the monetary values by using 2005 as the base year with the GDP deflator series. This approach is similar to how Worldscope handled the adoption of Euro by newly member countries.[15] Prior studies that examine data from multiple countries or data over an extensive time period often report figures in a common currency and adjusted to a particular base year (e.g. Hovakimian, 2011).

[15] Thomson Financial, Worldscope Database, Issue 6, page 30: http://www-cgi.uni-regensburg.de/Fakultaeten/WiWi/roeder/DownloadsGeneral/Datastream%20Worldscope.pdf

Table 5.3

Adjusting Monetary Values.

	Reporting Currency	Currency after adjustment	Base Year	Method
UK	Pound Sterling	Euros	2005	(Reported value x GDP deflator base year / GDP deflator for the reporting year) x exchange rate.
France/Germany	Euros	Euros	2005	Reported value x GDP deflator base year / GDP deflator for the reporting year.

This table shows the method of converting all monetary values to a common currency and base year. The source of GDP deflators and the exchanges rates are ECB and World Bank.[16] Reporting currency of firms in France and Germany is Euros (€), and for the UK firms its Pound Sterling (£). We obtain 2005 € equivalent values for all countries. For France and Germany, this is done by producing a real terms series using 2005 as base year. For the UK, it's done by, first, producing a real terms series using 2005 as a base year, and secondly, converting the values into € using the exchange rate at the end of corresponding fiscal month.

[16] The exchange rates of GBP and Euro in 2005 are obtained from European Central Bank and European Commission - Eurostat. The GDP deflators for the UK, France and Germany are obtained from the World Bank. The base year is 2005.
European Commission – Eurostat:
http://epp.eurostat.ec.europa.eu/statistics_explained/index.php/Exchange_rates_and_interest_rates
European Central Bank:
http://www.ecb.europa.eu/stats/exchange/eurofxref/html/index.en.html
World Bank:
http://data.worldbank.org/indicator/NY.GDP.DEFL.ZS?order=wbapi_data_value_2005+wbapi_data_value&sort=asc&page=1
Further information on how to use GDP deflator series:
https://www.gov.uk/government/publications/how-to-use-the-gdp-deflator-series-practical-examples

5.5. Basic Statistics

In this section, we present the firm- and segment-level descriptive statistics from the UK, France and Germany. The main questions to be addressed are as follows. Are internal capital markets active and efficient? What was the impact of the financial crisis on internal capital markets? What are the similarities and differences in internal capital markets in market-based and bank-based system?

Although the financial crisis started sometime in 2007 in the US (Kuppuswamy and Villalonga, 2010), prior literature generally take 2008-2009 as the crisis period (e.g. Campello et al., 2011). In our analysis, we classify 2008 as early-crisis, 2009 as mid-crisis and 2010 as late-crisis period. During the financial crisis of 2008, the UK, France and Germany experienced significant loss of output and sharp fall in economic growth, as measured by growth in GDP.[17] Figure 1 below shows the GDP growth for the three countries between 2004 and 2012 and highlights the impact and magnitude of the financial crisis. The growth in GDP declines significantly between 2008 and 2009, and reached the lowest point during the year 2009 for all three countries. However, the percentage decline in GDP in France appears to be lower compared with the UK and Germany.

To determine the impact of the financial crisis on our key internal capital market variables, we present our data in two sections, namely, non-recession period (2005-2007) and recession period (2008-2010). We perform two statistical tests to distinguish the level of change in key variable in the two time periods, namely, the t-test and Mann-Whitney test. The average and median values which are statistically significant are marked accordingly.

In line with prior literature, we report that the investment, cash flow and sales decline significantly during the financial crisis period in all three countries (Kahle and Stulz, 2013).

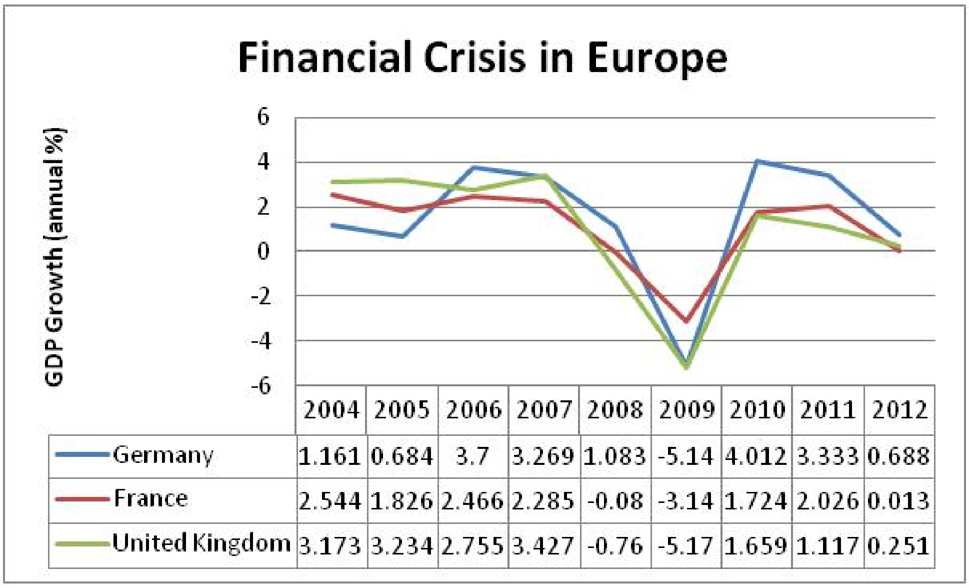
[17] The GDP growth (annual percentage) figures from 2004 to 2012 are obtained from World Bank for the UK, France and Germany. http://data.worldbank.org/indicator/NY.GDP.MKTP.KD.ZG

In general, we find that diversified firms have 3 segments on average and are significantly larger in market-based systems (measured by total assets). This finding is in line with the findings of Kumar, Rajan and Zingales (2000) who also report that firms in the UK are larger than firms in any other European country.

Additionally, we measure the degree of diversification of a firm by the Herfindahl Index (HI). A higher value corresponds to a higher concentration of the firm's activities in a particular industry and, thus, considered to be a more focused firm (Berger and Ofek, 1995; Rajan et al., 2000). It is calculated as the sum of squared ratios of segment assets over firm assets. Hovakimian (2011) reports the average (median) HI of 0.576 (0.550) in the US between 1980 and 2008. We report the average (median) HI of 0.416 (0.374) in the UK between 2005 and 2010. The HI is much higher in France and Germany as we report average (median) HI of 0.564 (0.394) and 0.643 (0.482) during the same period. In the next subsection, we begin our discussion by examining the data for the UK, followed by France and then Germany.

Figure 1

GDP Growth in the UK, France and Germany.



	2004	2005	2006	2007	2008	2009	2010	2011	2012
Germany	1.161	0.684	3.7	3.269	1.083	-5.14	4.012	3.333	0.688
France	2.544	1.826	2.466	2.285	-0.08	-3.14	1.724	2.026	0.013
United Kingdom	3.173	3.234	2.755	3.427	-0.76	-5.17	1.659	1.117	0.251

Source: World Bank

5.5.1. Findings from the UK

In Table 5.4, we present segment level descriptive statistics for the UK between 2005 and 2010. Our findings indicate a significant fall in the level of sales, investment and cash flow during the financial crisis compared with non-recession level (Kahle and Stulz, 2013). We also find that firms begin to sell-off their assets during the crisis as we report the average (median) total assets as 5.796 (0.237) billion prior to the crisis and 3.568 (0.088) billion during the crisis period. The differences in average and median values are statistically significant at 1 percent level. This suggests that firms expanded dramatically in the good times, and when the crisis hit, they significantly cut back on the scale of their operations.

Furthermore, we report the differences in average (median) segment investment level between non-recession and recession of 0.004 (0.002). This suggests that managers are more cautious about investing in new projects and segments significantly cut back on their investment during the recession. In line with this, Hovakimian (2011) reports a significant decline in corporate investments during financially constrained periods in the US. For example, she finds the average (median) growth in investments during financially relaxed and financially constrained period to be 0.008 (0.002) and 0.003 (-0.002), respectively.

Consistent with falling sales and revenue during the crisis, we also report a significant decline in the segments' investment opportunities during the financial crisis, measured by Tobin's-Q. We report the average (median) Tobin's-Q as 1.711 (1.532) before the crisis and 1.420 (1.249) after the crisis. Similarly, Hovakimian (2011) reports average (median) Tobin's-Q of 1.718 (1.476) between 1980 and 2008. Also, Ozbas and Scharfstein (2010) report a lower Tobin's-Q of 1.43 between 1980 and 2006. A reason for the differences in reported Tobin's-Q may be that we take our data from an economic boom and a financial crisis period.

Finally, we observe a small improvement in segment's return on assets during the crisis compared with non-recession level, although statistically insignificant. We find that the average return on assets increases from 0.100 in non-recession to 0.124 during the crisis. This may be due to the significant downsizing of segment assets by firms in response to the financial crisis. Hence, it appears that segments become more productive as managers come under pressure to improve the performance of their divisions.

Table 5.4

Descriptive statistics for segments in the UK.

	Mean	Median	Standard deviation
Total Assets (€)	4.354	0.129	24.711
Sales (€)	3.370	0.169	16.775
Capex / Total Assets	0.021	0.009	0.046
Cash flow / Total Assets	0.051	0.033	0.071
Tobin's-Q	1.561	1.392	1.226
ROA	0.115	0.109	0.290
Number of Observations	4,207		
Panel A			
Descriptive statistics during non-recessionary period			
Total Assets (€)	5.796	0.237	24.856
Sales (€)	4.295	0.304	18.439
Capex / Total Assets	0.024	0.010	0.051
Cash flow / Total Assets	0.056	0.036	0.071
Tobin's-Q	1.711	1.532	0.723
ROA	0.100	0.129	0.257
Number of Observations	1,517		
Panel B			
Descriptive statistics during recessionary period			
Total Assets (€)	3.568***	0.088[a]	24.598
Sales (€)	2.836***	0.116[a]	15.711
Capex / Total Assets	0.020**	0.008	0.042
Cash flow / Total Assets	0.047***	0.031	0.070
Tobin's-Q	1.420***	1.249[c]	1.414
ROA	0.124	0.118	0.307
Number of Observations	2,690		

The table shows segment level statistics and the time period is between 2005 and 2010. We take non-recessionary period as 2005-2007 and recessionary period as 2008-2010. The computations of variables (e.g. Tobin's-Q and ROA) are discussed above. Number of observations shows the segment years. The total assets and sales figures are in billion and adjusted to 2005 Euros. Using t-test (Mann-Whitney two sample statistic), the Mean and Median values marked with *** (a), ** (b) or * (c) are different from non-recession values at 1%, 5% and 10% significance level respectively.

As a next step, we present descriptive statistics at firm level for the UK between 2005 and 2010 in Table 5.5. As mentioned above, the UK being a market-based system has considerably higher number of firms listed on the exchange than France or Germany. Similarly, in the cross-country evidence provided by Lins and Sarvaes (1999) shows a significantly higher number of firms in the UK than in Germany. In general, we find that firms are larger in the UK than in other two countries. We report the average (median) total assets of a diversified firm to be 12.676 (0.457) billion Euros for the UK.

Additionally, we report that the average (median) capital expenditure of firms is around 5.6% (4.0%) of total assets of the firm before the crisis and it significantly declines to 4.9% (2.9%) during the crisis. This is likely to be due to lack of financial resources available through external markets (Hovakimian, 2011) and falling cash flow, sales and investment opportunities (Kahle and Stulz, 2013) indicating the severity of the crisis. In fact, we find that the average (median) cash flow also declines from 11.6% (11.3%) before the crisis to 8.2% (9.7%) during the crisis.

Table 5.5

Diversified firms in the UK.

	Mean	Median	Standard Deviation
Total Assets (€)	12.676	0.457	39.203
Sales (€)	9.946	0.425	32.963
Cash flow / Total Assets	0.094	0.102	0.168
Capex / Total Assets	0.052	0.033	0.065
Number of segments	3.003	3.000	1.393
Herfindahl Index	0.416	0.374	0.243
Number of Observations	2,010		
Panel A			
Summary statistics during non-recession period			
Cash flow / Total Assets	0.116	0.113	0.145
Capex / Total Assets	0.056	0.040	0.062
Number of Observations	747		
Panel B			
Summary statistics during recession period			
Cash flow / Total Assets	0.082***	0.097	0.178
Capex / Total Assets	0.049**	0.029	0.066
Number of Observations	1,263		

This tables shows firm-level variables between 2005 and 2010. The non-recession and recession periods are between 2005-2007 and 2008-2010, respectively. The total assets and sales figures are in billion and adjusted to 2005 Euros. The variables are discussed above. Number of observations shows the firm years. Using the t-test (Mann-Whitney two sample statistic), the Mean and Median values marked with *** (a), ** (b) or * (c) are different from non-recession values at 1%, 5% and 10% significance level respectively.

In Table 5.6, we present internal capital market variables before and during the financial crisis. The internal capital markets activity and efficiency variables are discussed in Section 5.2. Our main findings remain in line with Hovakimian (2011) and Kuppuswamy and Villalonga (2010) as we find inefficient internal capital markets within multi-segment firms, and efficiency significantly increases during financially constrained period compared with financially relaxed period. Furthermore, our analysis indicates that firms in the UK experience deep cutbacks in investments and significantly reduce the level of cross-subsidisation of capital resources during the crisis.

For example, the size of internal capital markets in the UK decreased significantly during the crisis period. We report the average (median) of S*ize* to be 0.418 (0.112) before the crisis and 0.204 (0.082) after the crisis. The change in average and median values in the two time periods is statistically significant at 1 percent level. This suggests that falling sales/revenue and a more stringent financial environment during the crisis leads to fewer resources available for reallocation. In addition, managers are more cautious about financing new investments during times of uncertainty. Thus, there is likely to be a lesser need for cross-subsidisation of capital resources.

In line with this, we find that the efficiency of internal capital markets significantly improves during the crisis. For example, we report the average (median) of *RVA* before the crisis as -0.033 (-0.001) and -0.002 (-0.000) in recession period. The change in efficiency before and after crisis is statistically significant at 5 percent level. The significant fall in internal capital allocations along with the increase in efficiency indicates that management cutback significantly on inefficient capital allocations. This evidence is in line with internal capital markets becoming more efficient during the crisis (Hovakimian, 2011). This suggests that in the presence of free cash flow during financially relaxed periods, managers are more likely to misallocate resources (Jensen, 1986; Hovakimian, 2011).

Consistent with increased financial constraints and decreased investment opportunities during the financial crisis, we find that Tobin's-Q significantly declines during the crisis in the UK. This suggests that a fall in investment opportunities results in reduced level of intra-segmental capital allocations within multi-segment firms. On the other hand, we find that segment ROA increases during the crisis. This is likely to be due to the significant assets sell-off activity undertaken by firms during the crisis as firms attempt to slim down and become more focused in a dynamic environment (Campello et al., 2011; Kahle and Stulz, 2013).

In line with Kahle and Stulz (2013), we find that diversified firms considerably reduce investments in new projects during the crisis, as we report significant decline in segments' capital expenditure across the firm. For example, we report the average *Capex* variable falls from 2.4% prior to the crisis to 2% after the crisis. Furthermore, the firm- and industry-adjusted investment also shows a significant decline, which is consistent with the results reported earlier.

Table 5.6

Internal capital markets in the UK.

	Mean	Median	Standard deviation	Number of Observations
Capex	0.021	0.009	0.046	4,207
Ind-Adj Capex	0.008	0.006	0.149	4,207
Firm-Ind-Adj Capex	0.029	-0.001	0.204	4,207
Size	0.283	0.019	0.690	2,010
RVA	-0.014	-0.000	0.173	2,010
Segment Tobin's-Q	1.561	1.392	1.226	4,207
Segment ROA	0.115	0.109	0.290	4,207
Panel A				
Descriptive statistics during non-recession period				
Capex	0.024	0.010	0.051	1,517
Ind-Adj Capex	-0.029	-0.004	0.199	1,517
Firm-Ind-Adj Capex	0.055	0.000	0.287	1,517
Size	0.418	0.112	0.973	747
RVA	-0.033	-0.001	0.259	747
Segment Tobin's-Q	1.791	1.592	0.723	1,517
Segment ROA	0.100	0.129	0.257	1,517
Panel B				
Descriptive statistics during crisis period				
Capex	0.020**	0.008[a]	0.042	2,690
Ind-Adj Capex	0.031***	0.009[a]	0.104	2690
Firm-Ind-Adj Capex	0.014***	-0.001[b]	0.136	2,690
Size	0.204***	0.082[a]	0.430	1,263
RVA	-0.002***	-0.000[b]	0.085	1,263
Segment Tobin's-Q	1.420***	1.249	1.414	2,690
Segment ROA	0.124	0.118	0.307	2,690

This table shows internal capital market variables between 2005 and 2010. The non-recession period is 2005-2007 and crisis period is 2008-2010. The *Size* and *RVA* of internal capital markets are computed at firm level and all other variables are computed at segment level. The computations of variables are discussed in Chapter 5. Number of observations show segment years. The mean, median and standard deviation are given for pre- and recession period. Using t-test (Mann-Whitney two sample statistic), the Mean and Median values marked with *** (a), ** (b) or * (c) are different from non-recession values at 1%, 5% and 10% significance level respectively.

5.5.2. Findings from France

Table 5.7 shows the descriptive results for segments of diversified firms in France between 2005 and 2010. We observe that segments in France appear to be much smaller (measured by total assets) compared with segments of diversified firms in the UK. However, this difference is to a higher extent when we compare the average values and to a lower extent when we compare the median values. For example, we report the average (median) segment assets of 2.027 (0.130) billion Euros in France. On the other hand, we report average (median) segment assets of 4.354 (0.129) billion Euros in the UK.

In line with the findings from the UK, we find that segments in France significantly cut back on their asset base during the crisis period. This appears to suggest that managers allowed their segments to grow considerably during the good times, and scale back significantly during the crisis. However, the impact of the financial crisis on segment investment appears to be less severe compared with the UK. For instance, we find that the average (median) decline in segment investment in France from non-recession to recession period of 0.002 (0.001). This suggests that segments in France cut back on capital expenditure during the crisis, but not as much as segments in the UK during the same period.

Furthermore, we find that investment opportunities decline considerably during the crisis as we report the average (median) segment Tobin's-Q of 1.468 (1.334) in non-recession and 1.347 (1.188) in recession period. This significant shift in Tobin's-Q shows the severity of the crisis and fall in the level of good projects available for investment. However, the change in Tobin's-Q from non-recession to recession period is lower in France compared with the UK. This appears to suggest that firms in the UK experienced much bigger decrease in Tobin's-Q compared with firms in France. Also, firms in the UK experience much steeper fall in segment investments, and sales during the same period compared with segments in France.

Table 5.7

Descriptive statistics for segments in France.

	Mean	Median	Standard deviation
Total Assets (€)	2.027	0.130	6.203
Sales (€)	1.731	0.113	6.220
Capex / Total Assets	0.020	0.009	0.026
Cash flow / Total Assets	0.041	0.021	0.078
Tobin's-Q	1.405	1.276	0.610
ROA	0.099	0.084	0.751
Number of Observations	1,888		
Panel A			
Descriptive statistics during non-recessionary period			
Total Assets (€)	2.331	0.139	7.174
Sales (€)	1.742	0.104	6.230
Capex / Total Assets	0.021	0.009	0.027
Cash flow / Total Assets	0.045	0.024	0.073
Tobin's-Q	1.468	1.334	0.659
ROA	0.124	0.089	0.971
Number of Observations	909		
Panel B			
Descriptive statistics during recessionary period			
Total Assets (€)	1.759***	0.119[a]	5.186
Sales (€)	1.702*	0.126[a]	6.213
Capex / Total Assets	0.019**	0.008	0.025
Cash flow / Total Assets	0.036***	0.018[a]	0.083
Tobin's-Q	1.347**	1.188[c]	0.554
ROA	0.089**	0.083	0.434
Number of Observations	934		

The table shows segment level statistics and the time period is between 2005 and 2010. We take non-recessionary period as 2005-2007 and recessionary period as 2008-2010. The computations of variables (e.g. Tobin's-Q and ROA) are discussed above. Number of observations shows the segment years. The total assets and sales figures are in billion and adjusted to 2005 Euros. Using t-test (Mann-Whitney two sample statistic), the Mean and Median values marked with *** (a), ** (b) or * (c) are different from non-recession values at 1%, 5% and 10% significance level respectively.

In Table 5.8 we present descriptive statistics at firm-level. In general, we find results suggesting that the financial crisis leads to a significant decline in investments and cash flow at firm level as well as segment level in France. For example, we report the average (median) investment level as 6.2% (4.7%) prior to the crisis and 4.7% (3.6%) during the crisis period. The difference in average value in the two time periods is statistically significant at 1 percent level.

Furthermore, we find that cash flow from operations generally tend to decline during the crisis. We report the average (median) cash flow as 0.079 (0.072) in non-recession and 0.062 (0.063) in the recession period. The difference in mean is statistically significant at 1 percent level. The segment level results coupled with firm level results give a clear picture of the impact of the financial crisis.

Table 5.8

Diversified firms in France.

	Mean	Median	Standard Deviation
Total Assets (€)	8.351	0.615	20.681
Sales (€)	6.067	0.515	14.961
Cash flow / Total Assets	0.070	0.067	0.088
Capex / Total Assets	0.054	0.041	0.061
Number of segments	2.835	3.000	1.374
Herfindahl Index	0.564	0.394	0.774
Number of Observations	885		
Panel A			
Summary statistics during non-recession period.			
Cash flow / Total Assets	0.079	0.072	0.084
Capex / Total Assets	0.062	0.047	0.073
Number of Observations	408		
Panel B			
Summary statistics during recession period.			
Cash flow / Total Assets	0.062***	0.063	0.092
Capex / Total Assets	0.047***	0.036	0.045
Number of Observations	477		

This tables shows firm-level variables between 2005 and 2010. The non-recession and recession periods are between 2005-2007 and 2008-2010, respectively. The total assets and sales figures are in billion and adjusted to 2005 Euros. The variables are discussed above. Number of observations shows the firm years. Using the t-test (Mann-Whitney two sample statistic), the Mean and Median values marked with *** (a), ** (b) or * (c) are different from non-recession values at 1%, 5% and 10% significance level respectively.

As a next step, we present our findings on internal capital markets from the French data in Table 5.9. In comparison to the results from the UK, internal capital markets are affected significantly by the onset of the financial crisis. However, we find that internal capital market activity increased significantly during the crisis compared to the non-recession level. For example, we report the average (median) of *Size* as 0.567 (0.155) prior to the crisis and 0.856 (0.163) after the crisis. The difference in mean in the two time periods is statistically significant at 5 percent level.

The significant increase in internal capital market activity during the crisis in France whereas a decrease in internal capital markets in the UK during the same period shows the differences in management decisions in these two countries. Internal capital markets played a greater role in the allocation of capital resources to finance investment projects across the firm during the crisis in France. Interestingly, we find that the efficiency of internal capital markets declined during the crisis. This is in contrast to the improvements in the efficiency of internal capital markets during the recession period reported for the UK. It appears that more capital is flowing towards weaker segments in France during the crisis. For example, we report average (median) *RVA* of 0.003 (-0.000) before the crisis and -0.018 (-0.004) in recession period. The differences in the average *RVA* is statistically significant at 5 percent level. This may suggest that management attempted to help those segments in financial difficulty, regardless of their investment opportunities.

Similar to the findings for the UK, we find that the financial crisis negatively affects the investment rate of segments of diversified firms in France. For example, the variable *Capex* declines from 2.1% before the crisis and 1.9% during the crisis period. However, in comparison with the UK, segments in France appear to experience lesser decline in investments. Similarly, we find that *firm- and industry-adjusted investment* increased during the crisis. This suggests that internal capital markets were successful in limiting the impact of credit and cash flow shocks on segment investment to a greater extent in France. It may be that French firms experienced less stringent environment and lesser financial constraints during the crisis.

Lastly, in line with falling sales and cash flow, and significant asset sell-off undertaken by firms, we find that Tobin's-Q significantly decreases during the crisis indicating reduced investment opportunities compared with non-recession level. The average segment Tobin's-Q declines from 1.468 prior to the crisis to 1.347 after the crisis, difference being statistically significant at 1 percent level. In line with this finding, return on assets also decreases during this period; however, the difference is insignificant at any level.

Table 5.9

Internal capital markets in France.

	Mean	Median	Standard deviation	Number of Observations
Capex	0.020	0.009	0.026	1,888
Ind-Adj Capex	-0.044	-0.003	0.797	1,888
Firm-Ind-Adj Capex	0.032	0.003	0.522	1,888
Size	0.765	0.157	2.092	885
RVA	-0.008	-0.000	0.089	885
Segment Tobin's-Q	1.405	1.276	0.610	1,888
Segment ROA	0.099	0.084	0.751	1,888
Panel A				
Descriptive statistics during non-recession period.				
Capex	0.021	0.009	0.027	909
Ind-Adj Capex	-0.024	-0.004	0.506	909
Firm-Ind-Adj Capex	0.016	0.004	0.449	909
Size	0.567	0.155	1.557	408
RVA	0.003	-0.000	0.056	408
Segment Tobin's-Q	1.468	1.334	0.659	909
Segment ROA	0.124	0.089	0.971	909
Panel B				
Descriptive statistics during crisis period.				
Capex	0.019*	0.008[c]	0.025	934
Ind-Adj Capex	-0.061***	-0.003	0.994	934
Firm-Ind-Adj Capex	0.047	0.001	0.581	934
Size	0.856**	0.163	2.490	477
RVA	-0.018**	-0.004	0.113	477
Segment Tobin's-Q	1.347***	1.188[a]	0.554	934
Segment ROA	0.089	0.083	0.434	934

This table shows internal capital market variables between 2005 and 2010. The non-recession period is 2005-2007 and crisis period is 2008-2010. The *Size* and *RVA* of internal capital markets are computed at firm level and all other variables are computed at segment level. The computations of variables are discussed in Chapter 5. Number of observations show segment years. The mean, median and standard deviation are given for pre- and recession period. Using t-test (Mann-Whitney two sample statistic), the Mean and Median values marked with *** (a), ** (b) or * (c) are different from non-recession values at 1%, 5% and 10% significance level respectively.

5.5.3. Findings from Germany

As discussed in Chapter 3, the German financial system is much more bank orientated compared with UK and France (Allen and Gale, 2000; Rajan et al., 2003). In addition, the Figure 1 above shows that Germany experienced a significant fall in GDP between the year 2008 and 2009, and significantly rises to non-recession level in 2010. On the other hand, UK and France experience a much slower recovery.

In Table 5.10 we present our descriptive statistics at segment level in Germany between 2005 and 2010. In general, the segments of diversified firms in Germany are smaller in size (as measured by total assets) than segments of diversified in the UK and France. Unlike our results from the UK and France, we find that total assets of segments did not decline significantly during the crisis period in Germany. We report the average (median) segment asset base of 1.835 (0.073) billion Euros prior to the crisis and 1.759 (0.077) billion Euros during the crisis. The change in asset base is insignificant at any significance level. This may suggest that firms in Germany experienced a less stringent environment or firms did not allow their segments to expand beyond their optimal size prior to the crisis and, therefore, did not scale back on assets during the crisis period.

Additionally, segments in Germany appear to invest less on average than their counterparts in other two countries. However, the financial crisis has a negative and significant impact on their operations. In line with Kahle and Stulz (2013) we find a significant fall in cash flow and capital expenditure across firms during the crisis. For example, the average (median) capital expenditure declines from 2.2% (1.1%) to 1.9% (1.0%). The difference in mean values is statistically significant at 1 percent level.

In contrast to findings from UK and France, we find that segment investment opportunities significantly increase during the crisis period. We report the average (median)

Tobin's-Q of 1.360 (1.248) before the crisis and 1.596 (1.329) during the crisis. In comparison, Sautner and Villalonga (2010) find average (median) Tobin's-Q of 1.55 (1.20) in Germany between 2000 and 2006. To investigate the rise in Tobin's-Q during the crisis, we analyse the change in Tobin's-Q in each year between 2008 and 2010, and find that Tobin's-Q declines during 2008 and 2009 (although insignificantly) compared with non-recession level; however, it significantly rises in 2010 as Germany rapidly emerges out of the recession. The increase in average Tobin's-Q in the recession period compared to the non-recession period appears to be driven by significant increase in Tobin's-Q in the year 2010. A stronger Tobin's-Q in 2010 suggests an increase in confidence in economic outlook and general certainty about the investment opportunities in Germany.

Table 5.10

Descriptive statistics for segments in Germany.

	Mean	Median	Standard deviation
Total Assets (€)	1.799	0.076	8.400
Sales (€)	1.828	0.095	6.438
Capex / Total Assets	0.021	0.010	0.025
Cash flow / Total Assets	0.046	0.028	0.067
Tobin's-Q	1.476	1.298	0.834
ROA	0.143	0.108	0.312
Number of Observations	3,085		
Panel A			
Descriptive statistics during non-recessionary period			
Total Assets (€)	1.835	0.073	9.096
Sales (€)	1.686	0.084	5.757
Capex / Total Assets	0.022	0.011	0.026
Cash flow / Total Assets	0.050	0.030	0.070
Tobin's-Q	1.360	1.248	0.725
ROA	0.142	0.111	0.307
Number of Observations	1,564		
Panel B			
Descriptive statistics during recessionary period			
Total Assets (€)	1.759	0.077	7.540
Sales (€)	1.984	0.106	7.105
Capex / Total Assets	0.019***	0.010	0.024
Cash flow / Total Assets	0.042***	0.027[c]	0.063
Tobin's-Q	1.596***	1.329	0.918
ROA	0.143	0.107	0.317
Number of Observations	1,521		

The table shows segment level statistics and the time period is between 2005 and 2010. We take non-recessionary period as 2005-2007 and recessionary period as 2008-2010. The computations of variables (e.g. Tobin's-Q and ROA) are discussed above. Number of observations shows the segment years. The total assets and sales figures are in billion and adjusted to 2005 Euros. Using t-test (Mann-Whitney two sample statistic), the Mean and Median values marked with *** (a), ** (b) or * (c) are different from non-recession values at 1%, 5% and 10% significance level respectively.

In Table 5.11 we present descriptive statistics at firm level in Germany between 2005 and 2010. We report the average (median) total assets of diversified firms to be 8.398 (0.298) billion Euros in Germany between 2005 and 2010. Similarly, Sautner and Villalonga (2010) report the average (median) total assets of firms in Germany as 6.715 (0.136) billion Euros between 2000 and 2006. Diversified firms in France and Germany appear to be significantly smaller in size (as measured by total assets of the firm) compared with diversified firms in the UK, particularly prior to the crisis. This suggests that firms in the UK grew substantially prior to the financial crisis and then significantly cut back on assets during the crisis. However, this was not the case with firms in bank-based systems.

Table 5.11

Diversified firms in Germany.

	Mean	Median	Standard Deviation
Total Assets (€)	8.398	0.298	27.814
Sales (€)	6.305	0.339	18.093
Cash flow/Total Assets	0.068	0.079	0.128
Capex / Total Assets	0.053	0.038	0.067
Number of segments	2.871	3.000	1.416
Herfindahl Index	0.643	0.482	0.499
Number of Observations	1,408		
Panel A			
Summary statistics during non-recession period.			
Cash flow / Total Assets	0.069	0.082	0.129
Capex / Total Assets	0.056	0.040	0.079
Number of Observations	762		
Panel B			
Summary statistics during recession period.			
Cash flow / Total Assets	0.064	0.075	0.126
Capex / Total Assets	0.049**	0.035	0.049
Number of Observations	646		

This tables shows firm-level variables between 2005 and 2010. The non-recession and recession periods are between 2005-2007 and 2008-2010, respectively. The total assets and sales figures are in billion and adjusted to 2005 Euros. The variables are discussed above. Number of observations shows the firm years. Using the t-test (Mann-Whitney two sample statistic), the Mean and Median values marked with *** (a), ** (b) or * (c) are different from non-recession values at 1%, 5% and 10% significance level respectively.

Lastly, Table 5.12 presents the findings on internal capital markets from the German data. Similar to the UK, we find that diversified firms significantly decrease internal capital market activity during the crisis period. We report the average (median) of *Size* as 0.436 (0.169) prior to the crisis and 0.325 (0.125) during the crisis. The change in average and median values in the two time periods is statistically significant at 1 percent level. This suggests that managers were more cautious about new investments and cutback on intra-segmental transfers of resources during times of uncertainty. These findings are in contrast with the results from France where we find the internal capital market activity increases significantly.

In line with the findings of Sautner and Villalonga (2010), we find that internal capital markets efficiently allocate resources during financially relaxed periods in Germany. However, we do not find any evidence to suggest that internal capital markets become more efficient or inefficient during the crisis compared to non-recession levels. We report the average (median) *RVA* to be 0.001 (-0.001) before the crisis and -0.002 (-0.000) after the crisis. The change in the efficiency variable in the two time periods is statistically insignificant. In general, internal capital markets appear to be much less inefficient in Germany compared with inefficient internal capital markets reported in UK and France.

Furthermore, the impact of the financial crisis on segment investments is comparable in the three countries. We find segment investments (*Capex)* significantly declined during the crisis to 1.9% from 2.2% of total assets during non-recession. The change in investments in the two periods is statistically significant at 1 percent level. This is in line with theory that fewer resources are available for investment during recessionary periods and managers are generally more cautious about new investments. However, the decrease in segment investment in Germany is to a lesser extent than the UK suggesting that segments of diversified firms in the UK experienced a more financially stringent environment.

Lastly, we find that the segment investment opportunities before and after the crisis change significantly. However, we find that Tobin's-Q increase during the recession period compared to the non-recession level. As discussed earlier, we find that Tobin's-Q decreases in 2008 and 2009, although not significantly, and then increases sharply in 2010. This is likely to indicate the growing confidence among investors about the economic outlook and investment opportunities in Germany.

Table 5.12

Internal capital markets in Germany.

	Mean	Median	Standard deviation	Number of Observations
Capex	0.021	0.010	0.025	3,085
Ind-Adj Capex	-0.015	0.007	0.279	3,085
Firm-Ind-Adj Capex	0.016	-0.000	0.185	3,085
Size	0.385	0.149	0.697	1,408
RVA	0.000	-0.000	0.026	1,408
Segment Tobin's-Q	1.476	1.298	0.834	3,085
Segment ROA	0.143	0.108	0.312	3,085
Panel A				
Descriptive statistics during non-recession period.				
Capex	0.022	0.011	0.026	1,564
Ind-Adj Capex	-0.029	0.005	0.294	1,564
Firm-Ind-Adj Capex	0.018	0.002	0.202	1,564
Size	0.436	0.169	0.715	762
RVA	0.001	-0.001	0.028	762
Segment Tobin's-Q	1.360	1.248	0.725	1,564
Segment ROA	0.142	0.111	0.307	1,564
Panel B				
Descriptive statistics during crisis period.				
Capex	0.019***	0.010[c]	0.024	1,521
Ind-Adj Capex	-0.000***	0.009[a]	0.261	1,521
Firm-Ind-Adj Capex	0.013	-0.001[a]	0.164	1,521
Size	0.325***	0.125[a]	0.671	646
RVA	-0.002	-0.000	0.022	646
Segment Tobin's-Q	1.596***	1.329[a]	0.918	1,521
Segment ROA	0.143	0.107[c]	0.317	1,521

This table shows internal capital market variables between 2005 and 2010. The non-recession period is 2005-2007 and crisis period is 2008-2010. The *Size* and *RVA* of internal capital markets are computed at firm level and all other variables are computed at segment level. The computations of variables are discussed in Chapter 5. Number of observations show segment years. The mean, median and standard deviation are given for pre- and recession period. Using t-test (Mann-Whitney two sample statistic), the Mean and Median values marked with *** (a), ** (b) or * (c) are different from non-recession values at 1%, 5% and 10% significance level respectively.

5.6. Summary

In this chapter, we examine two main methods of determining operation and efficiency of internal capital markets. The first approach was put forward by Shin and Stulz (1998) who build on the investment-cash flow model (Fazzari et al., 1988) and examine the relationship between investment and cash flow of other segments within the diversified firm. The second approach was developed by Rajan et al. (2000) which directly measures the efficiency of internal capital markets through two methods, namely, the absolute value added model and relative value added model.

The firm- and segment-level data as well as analysts' earnings forecast information is obtained for public listed companies in the UK, France and Germany from Datastream and I/B/E/S. We apply a number of restrictions on our data, such as excluding firms with key data items missing. We present basic descriptive statistics for the three countries and find that firms across the three countries significantly cut back on investments during the recent financial crisis. In line with prior literature, we report a significant decline in cash flow, sales and investment opportunities during the crisis period. Our results from the analysis on internal capital markets variables indicate that they are active and operate inefficiently in general. However, internal capital markets are more efficient in bank-based systems.

In Chapter 6, we present and discuss our findings on the operation and efficiency of internal capital markets in the UK, France and Germany. In addition, we examine the impact of the financial crisis on internal capital market activity in these three countries. Subsequently, in Chapter 7 we present and discuss our findings on the relationship between analysts' earnings forecast errors and internal capital market activity.

Chapter 6 – Financial Systems, Internal Capital Markets And Financial Crisis: Evidence From The Uk, France And Germany

6.1. Introduction

As discussed in Chapter 2, internal capital markets facilitate the allocation of resources within multi-segment firms (Lamont, 1997; Shin and Stulz, 1998). On the one hand, they can enable multi-segment firms to pool capital resources and finance good investment projects of segments which could not have been financed otherwise (Stein, 1997, 2003). On the other hand, prior literature suggests that internal capital markets generally misallocate resources and finance poor investment projects (e.g. Hovakimian, 2011).

More recent studies have shown that country characteristics as well as characteristics of the firm can affect the operations and efficiency of internal capital markets (e.g. Gugler et al., 2013; Buchuk et al., 2014). Furthermore, studies examining the impact of a financial crisis on the internal capital markets operations and efficiency across countries have generally produced mixed findings (Lee et al., 2008; Hovakimian, 2011).

In this chapter, we present and discuss the results from our empirical analysis on the operation and efficiency of internal capital markets in market- and bank-based systems. Our main research questions are (i) whether diversified firms based in these two distinct financial systems operate internal capital markets, (ii) are internal capital markets efficient or inefficient, (iii) what impact did the financial crisis have on their operation and efficiency, and (iv) the similarities and differences in investment policies of multi-segment firms based in the three countries, namely, the UK, France and Germany.

In Section 6.2, we begin by discussing our model to determine whether internal capital markets are active and efficient. In Section 6.3, we present and discuss our results from the multivariate analysis. As a next step, we discuss the cross country variations in the activity and efficiency of internal capital markets in Section 6.4. The robustness of our findings are discussed in Section 6.5. Finally, we summarise the chapter in Section 6.6.

6.2. The Basic Model

The main objective of the study is to determine whether diversified firms actively engage in the transfer of capital resources between segments and whether these capital allocations are efficient or inefficient. As discussed in Chapter 5, there are two main methods to determine the activity and efficiency of internal capital markets which have been used extensively in the prior literature (for example see, Maksimovic and Phillips (2007) for a literature review of studies on internal capital markets). In the following subsections, we describe our model to determine the operations and efficiency of internal capital markets.

6.2.1. Investment-Cash Flow Model

We follow Shin and Stulz (1998) to examine the relationship between investment and cash flow. As discussed in Chapter 5, this approach builds on the investment-cash flow model put forward by Fazzari et al. (1988) by examining the relationship between segment investment and its own cash flow as well as cash flow of other segments within the firm. The intuition here is that a rise in cash flow of a segment is likely to increase the level of resources available for reallocation at firm level and, therefore, increase the level of resources available for investments across the firm. If internal capital markets are efficient then capital resources should be directed towards segments with good opportunities. Thus, our primary variable of interest in our analysis is the segment investment level, which is the capital expenditure of segments of diversified firms.

$$\frac{I_{i,j}(t)}{TA_{j}(t-1)} = \beta_1 \text{ x } \frac{S_{i,j}(t-1) - S_{i,j}(t-2)}{S_{i,j}(t-2)} + \beta_2 \text{ x } \frac{C_{i,j}(t)}{TA_{j}(t-1)} + \beta_3 \text{ x } \frac{O_{i,j}(t)}{TA_{j}(t-1)} + \beta_4 \text{ x Tobin's} - Q_{i,j}(t-1) + n_{i,j} + e_{i,j}(t) \quad (6.1)$$

In Equation (6.1), i and j refer to segment i of firm j, and t is the year of disclosure. Our dependent variable I is the capital expenditure of segment i of the firm j in the reporting year t, normalised by firm assets at the beginning of the year. Our objective is to determine how investment of a segment varies with cash flow of other segments within the firm as well as its own cash flow. If segments within the conglomerate are financially interdependent, then a financial shock to one segment will affect the cost of finance of another segment (Lamont, 1997). For example, cash flow generated by one segment may be used to finance investment projects in another segment across the firm (Shin and Stulz, 1998) and, therefore, cash flow shocks to one segment can affect the investment level of other segments within the firm.

Thus, the main independent variable in our analysis is the $o_{i,j}$, which is the sum of cash flow of all other segments within the firm, excluding its own. This variable is a proxy for resources available for reallocation within the firm and it has been used extensively in the prior literature (e.g. Lamont, 1997; Shin and Stulz, 1998; Hovakimian, 2011). For example, Lamont (1997) finds that large oil firms in the US used cash flow of cash-rich segments to finance investment projects of other segments across the firm. Also, Shin and Stulz (1998) find that large segments usually subsidise investment of smaller segments within the firm. Berger and Ofek (1995) find that diversified firms tend to subsidise loss-making segments, suggesting that managers may misallocate free cash flow (Jensen, 1986).

In addition, we include the variable $c_{i,j}$ in our analysis which is the segment's own cash flow, a proxy for availability of own resources. For example, Shin and Stulz (1998) find that segments' investment is more sensitive to its own cash flow than the cash flow of other segments within the firm. This suggests that an adverse cash flow shock to its own cash flow has a larger impact on investment than an adverse shock to cash flow of other segments within the firm. This is of particular importance as segments are likely to face adverse cash flow shocks during the financial crisis (Kahle and Stulz, 2013) and, hence, may rely more on cash flow of other segments for financing their investment projects during this period.

Additionally, we include Tobin's-Q as a proxy for investment opportunities $Q_{i,j(t-1)}$. Internal capital market theory promotes that resources should be used to finance good investment projects i.e. resources should flow towards high-Tobin's-Q segments and away from low-Tobin's-Q segments. If internal capital markets are efficient then a segments' investment should rise or fall with increasing or decreasing investment opportunities. Therefore, we expect investment to be positively related to Tobin's-Q. As discussed in Chapter 5, Tobin's-Q cannot be computed at segment level and, therefore, it is estimated by taking the median Tobin's-Q of focused firms operating in the same industry.

Subsequently, we also include Sales Growth ($S_{i,j}$) in our analysis, which is the *Sales (t-1)* minus *Sales (t-2)* divided by *Sales (t-2).* Thus, it's the change in sales or revenue of segment over prior reporting year as a proxy for growth. A higher sales growth of a segment is likely to indicate more profitable segments, and such segments are likely to invest more than segments which experience lesser growth in sales. Unlike Tobin's-Q which is constructed using industry average variable, sales growth is constructed using segment level data. We assume the error term has two components, and $n_{i,j}$ is specific to segment.

To determine the impact of the financial crisis of 2008 on our key variables, we include time dummy variables in our model. We pay particular attention to the variables 2008 (early-crisis), 2009 (late-crisis) and 2010 (late-crisis). These variables take a value of 1 if the reporting year is 2008, 2009 or 2010, respectively, and zero otherwise. The year 2005 is the reference point in our analysis. The recent financial crisis exposed fundamental weaknesses in the global financial system (Kahle and Stulz, 2013; Rudolph and Schwetzler, 2013) and had enormous economic costs in terms of lost output, higher unemployment and weakened public finances all across Europe.[18] In short, during the build-up to the crisis lenders and borrowers took on excessive and ill-understood risks, and banks operated with excessive leverage and inadequate liquidity. When the crisis hit, banks were not in a position to absorb losses of such magnitude. To ensure continuous running of the basic banking services, governments and central banks injected vast amounts of capital and liquidity into the financial system.

6.2.2. Relative Value Added Model

As discussed in Chapter 5, we follow Rajan et al. (2000) and obtain the two additional measures of capital allocations within multi-segment firms, namely, the *industry-adjusted investment* and *firm- and industry-adjusted investment* of segments. These variables indicate whether a segment of a diversified firm invests more or less than it would have been able to invest if it was a single segment firm. Furthermore, we measure the size of an internal capital market by taking the absolute sum of subsidies and transfers of capital resources within the firm in a particular year, and compute the relative value added by allocation (*RVA*) as a direct measure of internal capital market efficiency.

$$I_{i,j}^{ind}(t) = \beta_1 \text{ x } Q_{i,j}(t-1) + \beta_2 \text{ x } ROA_{i,j}(t-1) + \beta_3 \text{ x } Crisis_{i,t} + \beta_4 \text{ x } Crisis_{i,t} \text{ x } ROA_{i,j}(t-1) + \beta_5 \text{ x } Crisis_{i,t} \text{ x } Q_{i,j}(t-1) + [\text{Control Variables}_{i,j}(t)] + n_{i,j} + e_{i,j}(t) \qquad (6.2)$$

[18] For detailed discussion on the impact of the financial crisis in Europe see, Economic Crisis in Europe: Causes, Consequences and Responses, European Commission, 2009. http://ec.europa.eu/economy_finance/publications/publication15887_en.pdf

In Equation (6.2), the dependent variable is the *industry-adjusted investment* of segment *i* of firm *j* in year *t.* We also repeat the analysis by setting the dependent variable as *firm- and industry- adjusted investment* or *Size* of internal capital markets. Rajan et al. (2000) argue that when segments are expected to make an efficient investment, headquarters should allocate more resources to segments with good investment opportunities and away from segments with poor investment opportunities. However, empirical results suggest that weaker segments generally invest more than industry averages (Rajan et al., 2000; Scharfstein and Stein, 2000). We include the variable Tobin's-Q as a proxy for segment investment opportunities in our analysis. In addition to the proxy for investment opportunities, we include the variable *ROA* (return on assets at segment level at beginning of the year) as a measure of segment profitability.

Given that our objective is to determine the impact of the financial crisis on segment investment, we include the *Crisis* variable which takes a value of 1 if the reporting year is 2008 or later, and takes a value of 0 otherwise. Prior literature suggests that internal capital markets allocate more resources to finance investment projects of high-Tobin's-Q segments during financially constrained periods (Hovakimian, 2011; Kuppuswamy and Villalonga, 2010). However, other studies have provided mixed evidence on their role and efficiency during a crisis (e.g., Lee, Park and Shin, 2008). We also include interaction of segment performance and investment opportunities with financial crisis variable. In Section 6.4, we extend the model to include country-dummy variables by pooling the data for the three countries in order to distinguish between the effects of the crisis on internal capital allocations in market- and bank-based financial systems.

As a next step, we set the dependent variable as the efficiency of internal capital markets, i.e. *RVA*. In Equation (6.3), *j* refers to the firm and *t* refers to the reporting year. Prior research from the US finds that internal capital markets generally operate inefficiently (Rajan et al., 2000; Scharfstein and Stein, 2000; Ozbas and Scharfstein 20110), however, firms improve their capital allocation process during financially constrained periods (Hovakimian, 2011; Kuppuswamy and Villalonga, 2010). In contrast, Lee et al. (2008) find that efficient internal capital markets stop functioning after the financial crisis of 1997 in Korea.

$$\mathrm{RVA}_{j,t} = \beta_1 \text{ x } \mathrm{Size\_ICM}_{j,t} + \beta_2 \text{ x } \mathrm{HI}_{j,t} + \beta_3 \text{ x } \mathrm{Crisis}_{j,t} \text{ x } \mathrm{Size\_ICM}_{j,t} + \beta_4 \text{ x } \mathrm{Crisis}_{j,t} \text{ x } \mathrm{HI}_{j,t} + \beta_5 \text{ x } \mathrm{Crisis}_{j,t} + \left[\text{Control Variables}_{j,t}\right] + n_j + e_{j,t}$$

(6.3)

Our objectives are (i) to determine the impact of the financial crisis on the efficiency of internal capital markets, and (ii) the relationship between the size and efficiency of internal capital markets. In particular, we discuss the similarities and differences in internal capital market efficiency before and during the financial crisis in two distinct financial systems. As discussed in Chapter 3, we argue that diversified firms in bank-based systems are likely to experience less stringent environment due to their close relationship with banks (e.g. Hoshi et al., 1991; Rajan and Zingales, 2003) and, therefore, managers in these countries are likely to come under less pressure to significantly improve their capital allocation process.

Finally, our control variables include *HI*, the Herfindahl Index, to determine whether diversity has an impact on our key internal capital market variables. A higher *HI* corresponds to a higher concentration of the firm's activities in a particular industry and, thus, a more focused firm. We also include the size of the firm and segment as control variables in our analysis as prior research has shown that smaller segments within large, well-diversified firms are usually allocated more resources and tend to invest more than their industry average.

Additionally, prior literature has argued that leverage creates pressure to service debt obligations (Hovakimian, 2011), which in turn, reduces the problem of overinvestment of free cash flow (Jensen, 1986). Peyer and Shivdasani (2000) find that presence of debt creates pressure to meet interest obligations, which in turn, provides incentives to select investments that generate high levels of current cash flow. However, Ahn, Denis, and Denis (2006) find that the negative impact of leverage on investment is stronger for high-Tobin's-Q segments. We follow prior literature to include short-term debt and long-term debt normalised by total assets of the firm. We expect that, in the presence of high monitoring such as in bank-based systems, free cash flow is less likely to be used to finance projects that generate high private benefits for management at the expense of shareholders as documented in prior literature (Jensen, 1986; Peyer and Shivdasani, 2000) and internal capital markets are likely to be more efficient.

6.3. Multivariate Analysis

For this analysis, we utilise firm- and segment-level panel data to construct our internal capital markets variables. In this section, we perform a number of tests and discuss some of the problems associated with panel data analysis.

For our analysis, we obtain firm- and segment-level panel data for a large number of listed firms in three countries over a six year period. In order to track the segment and firm over time, we create a panel ID unique to that segment or firm. Next, each segment and firm is indexed in a specific format, for example, $I_{i,j}(t)$ indicates investment by segment (*i*) of diversified firm (*j*) and in year (*t*). Similarly, $TA_j(t\text{-}1)$ indicates total assets of the firm (*j*) in year (*t-1*).

In general, the main benefit of panel data is that it allows researchers to control for unobserved characteristics, such as CEO and division managers' ability, and isolate the effect of specific actions or events (Wooldridge, 2006). However, panel data associated with diversified firms that have multiple segments can also increase the complexity with the analysis of the data, as discussed in the proceeding subsections.

6.3.1. Multicolinearity

O'Brien (2007) documents that in the presence of perfect multicolinearity, the standard errors will not be correct and efficient. This is because, (i) it may produce models where R_j^2 is high but none of the explanatory variables are significant, (ii) produce results with "incorrect sign" and, (iii) situations where parameter estimates are very sensitive to small changes in the data (Belsley et al., 1980; Grenne 1993).

The Gauss-Markov assumption only requires that there should not be perfect linear relationship among independent variables. In that case, the coefficients will remain best linear unbiased estimators (BLUE). However, if there is perfect linear relationship or near perfect relationship among independent variables (i.e. close to one) then it is likely to cause statistical problems (Wooldridge, 2006). There are a number of procedures which can enable us to detect the presence of multicolinearity.

Firstly, pairwise correlations can highlight any significant linear dependence amongst independent variables. This is more likely to be an issue when variables are computed from one or more of the independent variables within the model. In Table 6.1, we present the correlation matrix showing our key variables for the three countries in our analysis. Secondly, an independent variable can be regressed on another independent variable within the model to determine any dependencies. This is usually referred to auxiliary regressions.

Table 6.1

Correlation Matrix

	Segment Capex	Own cash flow	Other cash flow	Sales Growth	Tobin's-Q	Ind-adj cap-ex	HI	Return on assets	Segment Assets	Firm Assets
Capex	1.000	-	-	-	-	-	-	-	-	-
Own cash flow	0.105	1.000	-	-	-	-	-	-	-	-
Other cash flow	-0.144	0.067	1.000	-	-	-	-	-	-	-
Sales Growth	-0.015	-0.037	-0.004	1.000	-	-	-	-	-	-
Tobin's-Q	0.022	0.022	-0.017	-0.008	1.000	-	-	-	-	-
Ind-adj capex	0.162	-0.001	-0.027	-0.001	-0.129	1.000	-	-	-	-
HI	0.014	0.023	0.047	0.005	-0.000	-0.024	1.000	-	-	-
ROA	0.005	0.079	0.139	-0.011	0.002	-0.051	-0.001	1.000	-	-
Segment Assets	0.026	0.038	-0.013	-0.009	0.007	-0.004	0.001	0.002	1.000	
Firm Assets	-0.022	-0.012	0.025	-0.008	-0.011	0.006	-0.017	0.006	0.658	1.000
Panel A										
France										
Capex	1.000	-	-	-	-	-	-	-	-	-
Own cash flow	0.304	1.000	-	-	-	-	-	-	-	-
Other cash flow	-0.037	-0.064	1.000	-	-	-	-	-	-	-
Sales Growth	-0.008	-0.003	-0.005	1.000	-	-	-	-	-	-
Tobin's-Q	0.047	0.084	-0.003	-0.009	1.000	-	-	-	-	-
Ind-adj capex	0.062	0.332	0.015	0.005	0.009	1.000	-	-	-	-
HI	0.275	0.138	0.089	-0.011	0.022	-0.032	1.000	-	-	-
ROA	0.015	0.181	0.005	0.001	-0.018	0.028	-0.004	1.000	-	-
Segment Assets	0.020	0.048	-0.091	-0.008	-0.030	0.004	-0.031	-0.009	1.000	-
Firm Assets	-0.106	-0.108	-0.041	-0.011	-0.048	0.026	-0.121	-0.016	0.716	1.000
Panel B										
Germany										
Capex	1.000		-	-	-	-	-	-	-	-
Own cash flow	0.018	1.000	-	-	-	-	-	-	-	-
Other cash flow	0.404	-0.320	1.000	-	-	-	-	-	-	-
Sales Growth	-0.005	-0.005	0.005	1.000	-	-	-	-	-	-
Tobin's-Q	-0.007	0.005	0.007	0.008	1.000	-	-	-	-	-
Ind-adj capex	0.015	0.025	-0.009	-0.001	0.019	1.000		-	-	-
HI	0.919	0.286	0.224	-0.004	-0.008	0.016	1.000	-	-	-
ROA	0.000	0.036	-0.012	-0.000	0.002	-0.019	0.000	1.000		-
Segment Assets	-0.005	-0.016	-0.026	0.002	0.017	-0.001	-0.005	0.003	1.000	-

Firm Assets	-0.009	-0.068	-0.007	0.006	0.045	0.011	-0.008	0.009	0.601	1.000

This table shows the correlation matrix for the UK, France (Panel A) and Germany (Panel B). The time period is between 2005 and 2010. The HI (*Herfindahl Index)* and *Firm Assets* are computed at firm level. All other variables are computed at segment level. *Capex* is the capital expenditure of segment and *Ind-Adj Capex* is the industry-adjusted capital expenditure of segments. *Own cash flow* is segment's own cash flow, which is calculated as operating income plus depreciation. *Other Cash flow* is the sum of cash flow of other segments within the firm. Tobin's-Q is the proxy for segments' investment opportunities and *ROA* is the return on segment assets. The methods for constructing these variables are discussed in Chapter 5.

The third approach involves examining the Variance Inflation Factors (VIF) to determine whether near high multicolinearity is present (O'Brien, 2007). VIF measures how much the variance of the coefficients is inflated by multicolinearity. As a rule of thumb, VIF of 1 indicates no colinearity and a value greater than 10 indicates high colinearity. The VIF measure is easily obtained in modern software packages, such as STATA, and it is given by:

$$VIF_j = \frac{1}{1 - R_j^2} \tag{6.4}$$

In the Equation (6.4), R_j^2 is obtained from regression testing. We repeat the VIF test for all models discussed in prior section that examine segment level as well as firm level data, to determine whether there is any linear relationship between variables. The results from the VIF test conducted on the investment-cash flow model are presented in Table 6.2. Given the thresholds above, we find that multicolinearity does not cause an issue in any of our analysis.

Table 6.2

Test for presence of Multicolinearity.

	UK		France		Germany	
	VIF	1/VIF	VIF	1/VIF	VIF	1/VIF
Own Cash	1.03	0.971	1.02	0.985	1.03	0.975
Other Cash	1.01	0.987	1.03	0.971	1.03	0.969
Sales Growth	1.01	0.989	1.01	0.989	1.00	0.998
Tobin's- Q	1.01	0.991	1.08	0.929	1.06	0.941
Year 2006	2.26	0.443	2.08	0.479	1.89	0.529
Year 2007	2.66	0.377	2.23	0.449	1.92	0.520
Year 2008	3.04	0.329	2.24	0.446	1.92	0.520
Year 2009	3.14	0.319	2.18	0.459	1.84	0.543
Year 2010	2.88	0.347	2.00	0.499	1.79	0.559
Mean VIF	2.00		1.65		1.50	

This table shows the Variance Inflation Factors (VIF) to determine whether multicolinearity is present in data for the UK, France and Germany. In the regression analysis, the dependent variable is capital expenditure of segments normalised by firm assets at the beginning of the year. *Own Cash* and *Other Cash* are segment's own cash flow and cash flow other segments within the firm, respectively. *Tobin's-Q* is the proxy for segment investment opportunities and *Sales Growth* is the change in segment sales at the beginning of the year. The time dummy variables take a value of 1 and 0. As a rule of thumb, a value greater than 10 represents high multicolinearity. This test is conducted with the investment-cash flow model. We also perform this test for other models in our analysis and find that multicolinearity is does not cause any problem in our analysis.

6.3.2. Serial Correlation

Next, we consider the possibility that the error terms from different time periods may be correlated. For example, diversified firms operate multiple segments and a random shock to a segment is likely to impact all its segments, i.e. the errors are likely to be correlated by segment. There are various tests to detect serial correlation, for example, the Durbin-Watson Test statistic (Durbin and Watson, 1950) for the first-order serial correlation in the disturbance when all the independent variables are strictly exogenous, i.e. uncorrelated with the error term.

In the presence of both time effect and firm effect, we include time dummy variables within the model and estimate the standard errors on the other dimension, i.e. cluster by firm. By allowing unobserved effects to be arbitrarily correlated with the explanatory variables in each time period, the purpose of the time dummy variables is to remove the correlation between observations in the same time period. Prior empirical studies have shown that in such a case the standard errors clustered by firm are unbiased (Petersen, 2009).[19]

6.3.3. Heteroskedasticity

The OLS makes an assumption that the error term is constant (homoskedasticity). However, in the event of variance of the error term, given the explanatory variables, is not constant then errors are said to be heteroskedastic. This can occur when observations are for the same time period but from different firms such as in the panel-data in our case. Thus, when heteroskedasticity is present, the least squares are not the best linear unbiased estimator

[19] Petersen (2009) shows that when there are only a few clusters in one dimension, clustering by the more frequent cluster yields results that are almost identical to clustering both by firm and time.

(BLUE). It does not affect the coefficients; however, the variance of the estimated parameters is biased.

To determine if heteroskedasticity is present, we follow Cameron and Trivedi (1990) and perform the information matrix test, and an orthogonal decomposition into tests for heteroskedasticity, skewness, and kurtosis for the models discussed in Section 6.2. The White (1980) test for homoskedasticity against unrestricted forms of heteroskedasticity is usually similar to the first term of the Cameron-Trivedi decomposition. Table 6.3 shows that heteroskedasticity is present in our dataset across the three countries. Thus, we correct for this by using the White's robust standard errors in all our regression tests.

Table 6.3

Test for Heteroskedasticity.

	UK			France			Germany		
	chi sq	Df	P	chi sq	Df	P	chi sq	Df	P
Heteroskedasticity	141.56	39	0.000	159.96	39	0.000	238.19	39	0.000
Skewness	21.96	9	0.009	224.78	9	0.000	256.18	9	0.000
Kurtosis	8.44	1	0.004	79.36	1	0.000	123.63	1	0.000
Total	171.96	49	0.000	464.11	49	0.000	618.00	49	0.000

This table shows the results from the information matrix test (the Cameron-Trivedi decomposition) to determine the presence of heteroskedasticity in our data for the UK, France and Germany. We perform this test for the investment-cash flow model and tests performed with other models yield similar results. The dependent variable in the investment-cash flow model is the capital expenditure of a segment normalised by total assets of the firm at the beginning of the year. The independent variables remain the same as above.

6.3.4. Fixed-Effects Estimation

One of the important advantages of panel data is the ability to control for unobserved heterogeneity. For example, we are interested in whether internal capital markets are efficient or inefficient within diversified firms. In addition to the several firm- and segment-level characteristics which are observable, there are many other characteristics which may have an impact on the operation and efficiency of internal capital markets but cannot be observed. Thus, there is potential for an omitted variable bias i.e. unobserved heterogeneity.

The unobserved variables, such as CEO and division managers' ability, are in the error term and may be correlated with the explanatory variables, which may result in biased estimates. For this reason, we make use of regression methods which decompose the error in two components; the firm-specific error term α_i and idiosyncratic error term e_{it}. The former is fixed over time i.e. time-constant unobserved heterogeneity, and the latter varies over time and it is uncorrelated with explanatory variables across all time periods. One of the techniques to eliminate the fixed effects is called the fixed effects transformation. Consider a simple model with just one explanatory variable as shown below:

$$y_{i,t} = \beta_1 x_{i.t} + \alpha_i + e_{it}$$

Next, for each *i* we average the equation over time and obtain the following equation.

$$\bar{y}_i = \beta_1 \bar{x}_{it} + \alpha_i + \bar{e}_{it}$$

As a next step, we subtract the second equation from the first equation. This results in the elimination of time-constant firm-specific error term. This means the unobserved effects are no longer cause a problem in the analysis.

$$y_{i,t} - \bar{y}_i = \beta(x_{it} - \bar{x}_i) + e_{it} - \bar{e}_i$$

The fixed effects method does not allow researchers to observe the effect of time-constant variables, e.g. the country in which the firm operates, as they are eliminated during the transformation. This is because the effect of any variable whose change over time is constant cannot be estimated (Wooldridge, 2006; pg. 489). An alternative method is to include the interaction of the time-constant variable with another variable of interest that does change over time.

The fixed effects transformation is not the only method which eliminates the time-constant unobserved effects. For example, the first differencing or the random effects model may also be used to achieve the same goal. Firstly, the first differencing method involves differencing the data rather than time-demeaning in the case of fixed effects. The decision to use fixed effects or first differencing may rely on the correlation between idiosyncratic errors over time. When the error term is serially correlated over time, then fixed effects method is more efficient than first differencing and standard errors reported by fixed effects are valid (Wooldridge, 2006).

Furthermore, the random effects model assumes that the explanatory variables are not correlated with the time-constant unobserved effects. If so, then eliminating the unobserved effects results in inefficient estimators. If explanatory variables are correlated with time-constant unobserved effects the random effects estimator is biased. Whereas, fixed effects allows arbitrary correlation between explanatory variables and unobserved effects.

Also, a commonly used method to determine whether fixed effects or random effects should be used is the Hausman Test (Hausman, 1978). In this test, the null hypothesis is that both fixed and random effects methods are good and they should yield coefficients that are similar. The alternative hypothesis is that the fixed effects estimation is better than the random effects estimation. If this is the case, then we would expect to see differences between the two sets of coefficients. We find a large and significant Hausman statistic which indicates that a large and significant difference between the fixed and random effects estimation. Thus, we use fixed effects method as it appears to be more appropriate than random effects method.

6.3.5. Selection Bias

It is now well documented that diversified firms generally trade at a discount (Berger and Ofek, 2005; Lins and Sarvaes, 1999) and that these firms tend to misallocate capital resources (Shin and Stulz, 1998; Rajan et al., 2000; Hovakimian, 2011). However, there have been a number of studies which have argued that these results may be due to selection bias and measurement errors (Campa and Kedia, 2002; Villalonga, 2004). This strand of literature argues that the diversification discount and inefficiency of internal capital markets may be due to the fact that firms choose to (or not to) diversify in certain lines of business.

In the presence of selection bias, the regression analysis will lead to inconsistent estimators. A number of estimators are available which correct for this (e.g. Heckman, 1979). However, Rajan et al. (2000) argue that measurement errors or selection bias may only account for some of the between-firm results reported on diversification. This is because, the authors control for firm-specific effects and, therefore, control for any consequences arising from the way the firm is set up and the results derive only from within-firm variations over time.

In addition to this, Laeven and Levine (2007) study financial firms between 1998 and 2002, and find a diversification discount even after correcting for selection bias. For example, the study finds that the market values of financial conglomerates that operate in multiple industries are lower than the value of the portfolio of financial intermediaries that specialise in the individual activities. More recent studies have examined the link between value of non-financial firms and efficiency of internal capital markets, and find that firm value increases (i.e. diversification discount decreases) when internal capital markets become more efficient (Kuppuswamy and Villalonga, 2010).

6.4. Empirical Results

In this section, we present our findings from the regression analysis for the three countries in our study. In general, our findings indicate that internal capital markets appear to be successful to some extent in transferring resources between segments within the firm, however, they are generally inefficient. This suggests that more resources appear to be allocated to less profitable segments of the firm. Furthermore, we show that the capital allocation process not only differs between single segment firms and multi-segment firms, but also between multi-segment firms across countries i.e. within market- and bank-based financial systems.

For example, we find that internal capital markets appear to be more active in France and less active in Germany compared with the UK. Also, the efficiency of internal capital markets significantly differs across multi-segment firms in these three countries. Consistent with prior literature, we find that internal capital markets operate inefficiently overall but they are less inefficient in Germany. In general, internal capital markets are less inefficient in bank-based systems compared with market-based systems. This suggests that financial system characteristic, such as supervisory role of markets and banks (Rajan and Zingales, 2003), role of banks in firms' investment selection process (Chakraborty and Ray, 2006) and ownership concentration of firms (Sautner and Villalonga, 2010) have a positive impact on the efficiency of capital allocation process within multi-segment firms in these countries.

Additionally, our findings on the impact of the financial crisis on internal capital markets indicate that their operations declined significantly in the UK but not in France and Germany. Furthermore, consistent with prior literature diversified firms in the UK significantly improved their investment policies during the financial crisis, which in turn, results in more efficient internal capital markets in the UK. However, we find that efficiency of internal capital markets did not improve in France or Germany during the crisis. In the following subsections, we begin our discussion with the findings for the UK followed by a discussion on the findings from France and Germany.

6.4.1. Evidence from the UK

In Table 6.4, we present our findings on the relationship between segment investment and cash flow. Our primary objective is to determine whether internal capital markets are active and play a significant role in allocation of capital within multi-segment firms. The dependent variable in our analysis is the capital expenditure of a segment normalised by firm assets at beginning of the year.

We include a number of explanatory variables which have shown to affect the investments of segments, as discussed in section 6.2. The main variable of interest in our analysis is the cash flow of other segments which is our proxy for the internal capital resources available for reallocation within the diversified firm in a particular year. Lamont (1997) and Shin and Stulz (1998) find a significant relationship between the proxy for internal capital resources available for reallocation (i.e. the cash flow of other segments within the firm) and investment of a segment.

In line with prior literature, our findings indicate a significant relationship between segment's capital expenditure and cash flow of other segments within the firm. This suggests that firms engage in cross-subsidisation of resources, and segments rely on transfer of capital resources through internal channels for investment. We report a coefficient of 0.044 for *Other Cash*, statistically significant at 10 percent level. These findings show that there is some evidence to suggest that internal capital markets are active.

The financial dependency also means that a cash flow shock to one segment of the firm is likely to be transmitted to other segments and may affect the cost of finance of other segments within the firm (Lamont, 1997). For example, Lamont (1997) document that when cash flow of oil segments declined in 1986, it lead to a significant decline in investments of non-oil segments of the firm. In relation to this, we examine the impact of the financial crisis on the investment and role of internal capital markets during this period. In general, we find that the financial crisis of 2008 affected all industries around the same time and, thus, lead to a firm-wide decline in capital resources and investment.

Next, we examine the impact of the financial crisis by including the dummy variable *Crisis*, which is equal to 1 if the reporting year is 2008 or later and zero otherwise. Furthermore, we include the interaction of *Crisis* with *Other Cash* as well as *Own Cash* in our analysis. We find that the coefficients are negative, but statistically insignificant. This suggests that segments do not rely more or less on cash flow of other segments during the crisis period compared to non-recession level as we had expected.

Our results show that segment investment is significantly more dependent on its own cash flow than the cash flow of other segments within the firm. We report the coefficient of

Own Cash as 0.105, statistically significant at 1 percent level. This implies that segments' internal resources are still the primary source of funding. Similar to the findings of Shin and Stulz (1998), this also suggests that internal capital markets play a significant but a limited role in the UK. A segment that faces adverse cash flow shock receives some or most of the impact of that shock and internal capital markets do not appear to fully substitute the role of internal finance.

In addition, we find that segment investment is positively related to investment opportunities. We report the coefficient of *Tobin's-Q* as 0.001, statistically significant at 5 percent level. The investment level of a segment increases (decreases) with increasing (decreasing) investment opportunities. This suggests that firms allow segments with good investment opportunities to invest more and reduce their investment level when their investment opportunities fall.

Finally, we examine the impact of the financial crisis on segment investment and find that segments experience a significant decrease in capital expenditure during the crisis period. For example, we find that capital expenditure significantly decline between 2008 and 2009 compared with non-recession level. This is in line with the prior literature documenting that firms significantly reduce their investments during such periods (Hovakimian, 2011; Kahle and Stulz, 2013). In this next section, we discuss the impact of the financial crisis of 2008 on the size of internal capital markets in the three countries in our analysis.

Table 6.4

Investment-Cash Flow Sensitivity in the UK.

	(1)	(2)
Sales Growth	-0.000	0.000
	(0.682)	(0.958)
Own Cash	0.105***	0.116***
	(0.000)	(0.000)
Other Cash	0.044*	0.062*
	(0.067)	(0.057)
Tobin's- Q	0.001**	0.001***
	(0.036)	(0.005)
Year 06	-0.005	-
	(0.167)	
Year 07	-0.003	-
	(0.476)	
Year 08	-0.003	-
	(0.370)	
Year 09	-0.007**	-
	(0.027)	
Year 10	-0.011***	-
	(0.000)	
Crisis	-	-0.003
		(0.265)
Crisis x Own-cash	-	-0.014
		(0.569)
Crisis x Other-cash	-	-0.264
		(0.194)
Constant	0.016***	0.013***
	(0.000)	(0.000)
Adj. R-Sq	0.069	0.070
Obs.	5,207	5,207

This table shows the estimation results from the investment-cash flow model for the UK. The time period is between 2005 and 2010. In this analysis, the dependent variable is capital expenditure of segments normalised by firm assets at the beginning of the year. *Own Cash* and *Other Cash* are segment's own cash flow and cash flow other segments within the firm, respectively. *Tobin's-Q* is the proxy for segment investment opportunities and *Sales Growth* is the change in segment sales at the beginning of the year. The time dummy variables take a value of 1 and 0. *Crisis* takes a value of 1 if the reporting year is 2008 or later and 0 otherwise. The regressions are estimated with fixed effects. Heteroskedasticity- and clustered-robust p-values are presented in parentheses. ***,**,* indicate significance at 1%, 5% and 10% level.

As a next step, we set the dependent variable as the *industry-adjusted investment* of segments of diversified firms. Our objective is to determine whether capital allocations within multi-segment firms become more efficient during the crisis period. Prior literature suggests that firms significantly improve their investment policies during recession and allocate more capital resources towards segments with good opportunities (Hovakimian, 2011). We present our empirical findings in Table 6.5.

In line with prior literature, we find that firms pay attention to segments' investment opportunities when allocating resources. For example, we report the coefficient of *Tobin's-Q* variable as 0.007 prior to the crisis and 0.009 during the crisis, statistically significant at 1 percent level. This suggests that firms continue to allocate resources to segments with good investment opportunities during economic uncertainty (Kahle and Stulz, 2013) which then helps to improve the efficiency of internal capital markets. This also suggests that managers are put under more pressure to make better use of internal capital resources during the recession.

On the other hand, our results show it is not the case that segments which have performed well in the past are allocated more resources. For example, we find that variable *ROA* is positive but insignificant in our analysis. This indicates that past performance of the segment does not result in the segment receiving more capital resources for investment. In line with Shin and Stulz (1998) we also find that firms allow smaller segments to invest more than industry average. This suggests that smaller segment generally receive resources and larger segments subsidise investments of smaller segments. In addition to this, it appears that segments associated with highly diversified firms tend to invest more than industry average. This result suggests that well-diversified firms allow their segment to take advantage of internal capital resources and enable them to invest more than their peers.

Furthermore, we examine the impact of the financial crisis on our dependent variable and report the during-crisis year dummy variable to be positive and statistically significant at 5 percent level. This again suggests that internal capital markets are successful at shielding some of the impact of credit- and cash-flow shocks and enable their segments to continue investment during the crisis. Shin and Stulz (1998) document that single segment firms invest more when they have more resources and invest less when they have fewer resources compared with segments of diversified firms. Our findings remain in line with prior literature on the advantages of operating internal capital markets (e.g. Stein, 1997, 2003).

Table 6.5

Industry-adjusted Investments in the UK.

	All segments	Non-recession	Recession
Tobin's- Q	0.007***	0.007***	0.009***
	(0.000)	(0.002)	(0.000)
Herfindahl Index	-0.058***	-0.199**	-0.060**
	(0.001)	(0.012)	(0.024)
ROA	0.000	0.014	0.005
	(0.672)	(0.315)	(0.465)
Log(Total Assets)	0.041**	0.118	-0.055
	(0.030)	(0.106)	(0.203)
Log(Segment Assets)	-0.019**	0.013	-0.042*
	(0.049)	(0.763)	(0.053)
Year 06	-0.006	-0.020	-
	(0.519)	(0.150)	
Year 07	-0.005	-0.027	-
	(0.546)	(0.108)	
Year 08	0.021**	-	-
	(0.024)		
Year 09	0.052***	-	0.036***
	(0.000)		(0.000)
Year 10	0.057***	-	0.036***
	(0.000)		(0.000)
Constant	-0.157	-0.755*	0.522**
	(0.155)	(0.099)	(0.037)
Adj. R-Sq.	0.011	0.003	0.000
Obs.	5,129	1,989	3,088

In this analysis, the dependent variable is the industry-adjusted capital expenditure of segment. The time period is between 2005 and 2010. We take non-recession as 2005-2007 and recession period as 2008-2010. All independent variables are discussed above. The regressions are estimated with fixed effects. Heteroskedasticity- and clustered-robust p-values are presented in parentheses. ***,**,* indicate significance at 1%, 5% and 10% level.

Next, we examine the determinants of internal capital market activity by setting the dependent variable as the size of internal capital allocations of a firm within a particular year. We follow Rajan et al. (2000) and Sautner and Villalonga (2010) to compute the variable *Size*, as discussed in Chapter 5.

In Table 6.6, we present our findings from our analysis. We find that the firm diversity (Herfindahl Index) appears as a significant explanatory variable when determining whether internal capital markets are active or inactive. For example, we find that the coefficient of *HI* is 0.025, statistically significant at 1 percent level. This suggests that firms that have their segments operating in related industries tend to engage in more intra-segmental capital allocations. Managers are more likely to have in-depth knowledge about investment opportunities of segments that are closely related (Xuan, 2009), which in turn, may result in more transfers of capital resources between segments.

Additionally, we find that cash flow available within the firm is positively related to the size of internal capital markets. We report the coefficient of *Cash Flow* as 0.268, statistically significant at 10 percent level. This suggests that an increase in cash flow increases the level of resources available for reallocation within the firm, and hence, allows the firm to make transfers of capital resources between segments. However, it is not the case size of the firm has an effect on the size of internal capital markets. We find that the variable *Log(Total Assets)* appears positive and insignificant at any significance level.

Finally, we find no evidence to suggest that the presence of short- and long-term debt affects internal capital markets by forcing significant cash flow out of the firm which may then lead to fewer resources for allocation. For example, the presence of free cash flow may aggravate over-investment problem and managers may cross-subsidise resources to finance positive as well as negative NPV projects. However, these variables appear insignificant.

Table 6.6

The size of internal capital markets in the UK.

	(1)	(2)
Herfindahl Index	0.025***	0.024***
	(0.007)	(0.007)
Cash Flow	0.268*	0.269*
	(0.096)	(0.094)
Log(Total Assets)	0.014	0.031
	(0.892)	(0.769)
Short-Term Debt	0.133	0.141
	(0.352)	(0.324)
Long-Term Debt	-0.129	-0.118
	(0.465)	(0.508)
Tobin's-Q	0.016	0.009
	(0.631)	(0.750)
Inventory Turnover	0.000	0.000
	(0.481)	(0.372)
Year 06	0.064	-
	(0.224)	
Year 07	0.119*	-
	(0.064)	
Year 08	-0.081	-
	(0.130)	
Year 09	-0.056	-
	(0.297)	
Year 10	-0.049	-
	(0.355)	
Crisis	-	-0.071
		(0.168)
Constant	0.137	0.052
	(0.820)	(0.933)
Adj. R-Sq.	0.043	0.047
Obs.	1,602	1,602

This table shows the estimation results from the regression analysis. In this analysis, the dependent variable is the size of an internal capital market within a multi-segment firm in a particular year. The time period is between 2005 and 2010. *Crisis* takes the value of 1 if the reporting year is 2008 or later and 0 otherwise. All independent variables are discussed above. The regressions are estimated with fixed effects. Heteroskedasticity- and clustered-robust p-values are presented in parentheses. ***,**,* indicate significance at 1%, 5% and 10% level.

Finally, we investigate the determinants of the efficiency of internal capital markets in the UK. For this analysis, we set the dependent variable as *RVA*. Our objectives are to determine whether *Size* of an internal capital market is related to its efficiency and what impact did the financial crisis have on internal capital markets.

Table 6.7 shows the results from the analysis. Our results from the univariate analysis in Chapter 5 indicated that firms' cutback on unnecessary capital allocations during the crisis which is related to improvements in efficiency. In line with prior results, we find that firms become less inefficient at allocating resources during the crisis compared to non-recession level. This suggests that diversified firms significantly improve their investment policies during economic uncertainty and allocate more resources towards segments with good opportunities.

Additionally, we find that there is significant evidence to suggest that firms which operate larger internal capital markets are more inefficient. We report *Size* as negative with a coefficient of -0.129 and statistically significant. This suggests that managers allow good as well as poor investment projects to be financed through internal capital markets. These findings are in line with the results reported in Section 5.5 indicating that size of internal capital markets decreases significantly during the crisis and efficiency improves during this period.

Furthermore, we examine the impact of long-term and short-term debt has on the efficiency of internal capital allocations. Debt can require regular payments which can force cash out of the firm and, thus, leave fewer resources available for reallocation. It can also help realign managers' interests with the interest of shareholders, which can lead to more efficient capital allocations (Gertner et al. 1994). However, we report the variable for short- and long-term debt does not have any significant explanatory power in any of our tests.

Table 6.7

Efficiency of internal capital markets in the UK.

	(1)	(2)	(3)
ICM Size	-0.129***	-0.151***	-0.156***
	(0.000)	(0.000)	(0.000)
Cash flow	0.100	0.099	0.124
	(0.554)	(0.166)	(0.177)
Log(Total Assets)	0.110	0.079	0.027
	(0.333)	(0.487)	(0.548)
Short-term debt	-0.307	-0.273	0.039
	(0.197)	(0.272)	(0.831)
Long-term debt	-0.137	-0.193	-0.053
	(0.593)	(0.407)	(0.382)
Herfindahl Index	0.009***	0.009***	0.010***
	(0.000)	(0.000)	(0.001)
Year 2006	-0.184**	-	-
	(0.012)		
Year 2007	0.030	-	-
	(0.311)		
Year 2008	0.325	-	-
	(0.500)		
Year 2009	0.062*	-	-
	(0.058)		
Year 2010	0.080*	-	-
	(0.081)		
Crisis	-	-0.033	-0.016
		(0.252)	(0.424)
Crisis x ICM Size	-	-	0.021
			(0.644)
Crisis x Cash Flow	-	-	-0.026
			(0.794)
Crisis x Short-term Debt	-	-	-0.189
			(0.335)
Constant	-0.993	-0.807	-0.117
	(0.125)	(0.209)	(0.638)
Adj-R Sq	0.078	0.078	0.081
Obs.	1,471	1,471	1,471

In this analysis, the dependent variable is the efficiency internal capital market within a multi-segment firm in a particular year. Efficiency is calculated using the RVA method. The time period is between 2005 and 2010. *Crisis* takes the value of 1 if the reporting year is 2008 or later and 0 otherwise. All independent variables are discussed above. The regressions are estimated with fixed effects. Heteroskedasticity- and clustered-robust p-values are presented in parentheses. ***,**,* indicate significance at 1%, 5% and 10% level.

6.4.2. Evidence from France

As discussed in prior chapters, the segments of diversified firms in France are also completely owned by the parent firm and they are not separately listed. However, there are some key distinctions between the bank-based financial system in France compared with the market-based system in the UK which may affect the operations of firms based in these two systems, as discussed in Chapter 3. For example, the key differences relate in the governance and monitoring of firms within these systems that can affect the investment project selection process within firms (Tadesse, 2002, 2003; Chakraborty and Ray, 2006).

We begin by examining the relationship between investment and cash flow, and present the findings in Table 6.8. In general, our findings indicate that multi-segment firms actively engage in the cross-subsidisation of capital resources in France. We report a positive coefficient of 0.046 for *Other Cash*, statistically significant at 1 percent level. This suggests that segments of diversified firms in France are financially interdependent. The relationship between segment's investment and cash flow of other segments within the firm indicates that firms actively cross-subsidise resources to finance investment projects of a segment using cash flow of other segment within the firm.

A notable difference between the UK and France is the significant importance of the role of internal capital markets in the latter. For example, we find that the coefficient of *Other Cash* is significantly larger than the coefficient of *Own Cash* in France. This suggests that internal capital markets play a key role in allocating resources for investment. Similarly, when we examine the investment sensitivity with *Other Cash* during the crisis, we find that internal capital markets become more active during the crisis period and play an even more important role within diversified firms. For example, we report the coefficient of *Crisis* x *Other Cash* as 0.026, statistically significant at 5 percent level.

In line with the prior literature, we find segment investment is significantly sensitive to its own internal resources as well resources available within the firm. We report the coefficient of 0.033 for *Own Cash*, statistically significant at 1 percent level. This suggests that a shock to its own cash flow has a significant impact on its investment level. However, internal capital markets in France appear to be better able to shield segments capital expenditure from variations in their own cash flow as we find that segment investment is significantly more dependent on cash flow of other segments as well as its own cash flow.

In addition to this, we examine the impact of the financial crisis and find a significant reduction in segment investment only in year 2009 in France, whereas for UK we report a significant reduction in 2009 and 2010. This may suggest, firstly, firms in market-based systems experienced more stringent financial environment which lead to deeper cutback in investments. Secondly, bank-based financial system provided more financial stability to firms through their close relationship with banks. Thirdly, it may be that diversified firms in France had built up a financial slack which could have enabled them to continue investing when the crisis began in 2008.

Unlike the results from the UK, we find that the variable for investment opportunities (segment Tobin's-Q) appears as insignificant. This suggests that firms pay less attention to public signals about investment opportunities of segments when allocating resources and may rely more on private signals e.g. division managers assessment of projects available for investment. It may be that managers rely more on private signals (e.g. division managers' assessment of the investment project) or it may be due to the smaller sample size for the French data, there isn't sufficient variation to be able to determine the effect of Tobin's-Q on investment. In comparison to the firms in the UK, firms in France appear to rely more on managers' expertise rather than market signals to when allocating capital resources.

Table 6.8

Investment-Cash Flow Sensitivity in France

	(1)	(2)
Sales Growth	0.000	0.000
	(0.573)	(0.471)
Own Cash	0.033***	0.034**
	(0.003)	(0.021)
Other Cash	0.046***	0.038***
	(0.000)	(0.002)
Tobin's-Q	-0.000	0.000
	(0.588)	(0.767)
Year 06	-0.001	-
	(0.225)	
Year 07	0.000	-
	(0.822)	
Year 08	0.001	-
	(0.592)	
Year 09	-0.004***	-
	(0.004)	
Year 10	-0.002	-
	(0.342)	
Crisis	-	-0.003**
		(0.043)
Crisis x Own cash	-	-0.001
		(0.953)
Crisis x Other cash	-	0.026**
		(0.015)
Constant	0.017***	0.016***
	(0.000)	(0.000)
Adj. R-Sq	0.014	0.010
Obs.	1,888	1,888

This table shows the estimation results from the investment-cash flow model for France. The time period is between 2005 and 2010. In this analysis, the dependent variable is capital expenditure of segments normalised by firm assets at the beginning of the year. *Own Cash* and *Other Cash* are segment's own cash flow and cash flow other segments within the firm, respectively. *Tobin's-Q* is the proxy for segment investment opportunities and *Sales Growth* is the change in segment sales at the beginning of the year. The time dummy variables take a value of 1 and 0. *Crisis* takes a value of 1 if the reporting year is 2008 or later and 0 otherwise. The regressions are estimated with fixed effects. Heteroskedasticity- and clustered-robust p-values are presented in parentheses. ***,**,* indicate significance at 1%, 5% and 10% level.

As a next step, we examine the *industry-adjusted investment* and the *size* of internal capital markets in diversified firms. Table 6.9 presents the empirical results from the analysis. In line with the earlier findings from the univariate analysis on the decrease in efficiency of internal capital markets during the crisis, we find that segments with low-Tobin's-Q are allocated more resources than segments with high-Tobin's-Q during the crisis period in France. For example, when the dependent variable is *industry-adjusted investment* during the crisis, we report the coefficient of Tobin's-Q as -0.319, statistically significant at 1 percent level.

On further analysis, we find that this only the case during the crisis and not prior to the crisis. This may suggest that firms did not update their investment policies during the crisis and, thus, segments which may have had good investment opportunities prior to the crisis continued to receive resources during the crisis, even when they no longer had the best opportunities within the firm. Similarly, we notice that the variable *ROA* changes sign from positive prior to the crisis to negative during the crisis suggesting that low performing segments were allocated more resources, but this finding statistically insignificant.

Unlike the findings for the UK, we find no evidence to suggest that smaller segments of the firm are allocated more resources in France. For example, our findings for the UK suggested larger segments of the firm end up subsidising investments of smaller segments, in line with prior literature from the US. However, we find the segment size variable appears to be negative, but it is statistically insignificant. Similarly, we find no evidence to suggest that segments that invest more or less than industry average belong to large diversified firms. In contrast to the findings for the UK, we find some evidence which indicates that firms which operate in related business lines invest more than industry average in France.

Table 6.9

Industry-adjusted Investments in France.

	All segments	Non-recession	Recession
Tobin's-Q	-0.114***	-0.022	-0.319***
	(0.000)	(0.168)	(0.001)
Herfindahl Index	-0.003	-0.018	0.275**
	(0.913)	(0.557)	(0.038)
ROA	0.017	0.022	-0.031
	(0.501)	(0.168)	(0.534)
Log(Total Assets)	-0.299	-0.319	1.361
	(0.176)	(0.403)	(0.342)
Log(Segment Assets)	-0.082	-0.171	-0.103
	(0.391)	(0.362)	(0.580)
Year 06	-0.122**	-0.092*	-
	(0.045)	(0.062)	
Year 07	-0.148**	-0.099	-
	(0.024)	(0.127)	
Year 08	-0.006	-	-
	(0.932)		
Year 09	-0.192**	-	-0.267***
	(0.011)		(0.007)
Year 10	-0.705***	-	-0.749***
	(0.000)		(0.000)
Constant	2.456*	2.919	-7.291
	(0.056)	(0.252)	(0.397)
Adj. R-Sq.	0.016	0.007	0.012
Obs.	1,861	834	789

In this analysis, the dependent variable is the industry-adjusted capital expenditure of segment. The time period is between 2005 and 2010. We take non-recession as 2005-2007 and recession period as 2008-2010. All independent variables are discussed above. The regressions are estimated with fixed effects. Heteroskedasticity- and clustered-robust p-values are presented in parentheses. ***,**,* indicate significance at 1%, 5% and 10% level.

As a next step, we examine the impact of the financial crisis on the size of internal capital markets. For this analysis, we set the *Size* as the dependent variable. The results are presented in Table 6.10. In contrast to the findings for the UK, we find that internal capital market activity increased during the crisis in France. These findings are consistent with earlier results from the univariate analysis. It may be that firms used internal capital markets to support financially weaker or segments that are in distress, in addition to financing investment projects in France. In the UK, we reported a significant decline in the level of transfers of capital resources.

It may also be that firms in France faced less stringent financial environment compared to the UK and, therefore, did not experience a significant reduction in the availability of external resources. Firms' easy access to external resources may have been used support weaker segments experiencing significant decline in sales and cash flow. Hence, their internal capital markets operations are not affected in the same way. In line with this theory, Hardie and Howarth (2009) document that the French government intervened during the crisis and forced banks to increase lending to domestic firms during this period.

Unlike the results for the UK, we find that diversity of firms does not appear to be a significant explanatory variable for the size of internal capital markets in France. In addition, we find no evidence to suggest that firms with large cash flow tend to operate larger internal capital markets, as such is the case in the UK. In fact, none of the variables in our analysis have significant explanatory power. This shows that determinants of internal capital markets size in the UK do not appear to affect French firms in the same way.

Table 6.10

Size of Internal Capital Markets in France.

	(1)	(2)
Herfindahl Index	0.124	0.146
	(0.400)	(0.329)
Cash Flow	0.109	-1.302
	(0.943)	(0.416)
Log(Total Assets)	1.866	1.587
	(0.170)	(0.240)
Short-Term Debt	0.486	1.546
	(0.798)	(0.360)
Long-Term Debt	-0.966	-0.627
	(0.506)	(0.687)
Tobin’s-Q	-0.008	-0.177
	(0.954)	(0.033)
Inventory Turnover	0.000	0.000
	(0.167)	(0.885)
Year 06	0.144	-
	(0.478)	
Year 07	0.285	-
	(0.223)	
Year 08	-0.188	-
	(0.458)	
Year 09	0.486*	-
	(0.061)	
Year 10	1.246**	-
	(0.001)	
Crisis	-	0.401
		(0.123)
Constant	-10.695	-8.992
	(0.192)	(0.270)
Adj. R-Sq.	0.011	0.006
Obs.	645	645

This table shows the estimation results from the regression analysis. In this analysis, the dependent variable is the size of an internal capital market within a multi-segment firm in a particular year. The time period is between 2005 and 2010. *Crisis* takes the value of 1 if the reporting year is 2008 or later and 0 otherwise. All independent variables are discussed above. The regressions are estimated with fixed effects. Heteroskedasticity- and clustered-robust p-values are presented in parentheses. ***,**,* indicate significance at 1%, 5% and 10% level.

Lastly, we examine the efficiency of internal capital markets and present the findings in Table 6.11. The dependent variable in this analysis is *RVA*. In contrast to the findings from the UK, the results in this analysis indicate that internal capital markets efficiency does not improve in France during the crisis of 2008. On the other hand, there appears to be some evidence to suggest that efficiency decreases during the crisis, in line with our findings from the univariate analysis.

For example, we find that the *Crisis* variable becomes negative and significant when the dependent variable is *RVA.* We report the coefficient of the variable as -0.013, significant at 10 percent level. The change in efficiency from non-recession to recession level is statistically significant. Nevertheless, these findings show an important distinction in the investment policies during the crisis between the UK and France.

Our main results for the UK are consistent with prior literature on internal capital markets becoming significantly more efficient in the US during the crisis (Hovakimian, 2011). However, this does not appear to be the case for France. Also, unlike the findings for the UK, the size of internal capital markets does not appear to be a significant explanatory variable in France.

Table 6.11

Efficiency of Internal Capital Markets in France.

	(1)	(2)	(3)
ICM Size	-0.025	-0.025	-0.025
	(0.174)	(0.147)	(0.144)
Cash flow	0.153	0.159	0.163
	(0.225)	(0.177)	(0.173)
Log(Total Assets)	-0.070	-0.067	-0.073
	(0.250)	(0.254)	(0.297)
Short-term debt	-0.018	-0.028	-0.022
	(0.878)	(0.816)	(0.857)
Long-term debt	-0.044	-0.049	-0.045
	(0.677)	(0.646)	(0.655)
Herfindahl Index	-0.010	-0.009	-0.009
	(0.147)	(0.155)	(0.211)
Year 2006	-0.005	-	-
	(0.773)		
Year 2007	-0.004	-	-
	(0.849)		
Year 2008	-0.010	-	-
	(0.480)		
Year 2009	-0.022	-	-
	(0.289)		
Year 2010	-0.018	-	-
	(0.517)		
Crisis	-	-0.012*	-0.013*
		(0.076)	(0.058)
Crisis x ICM Size	-	-	0.001
			(0.879)
Crisis x Cash Flow	-	-	0.042
			(0.621)
Crisis x Short Term Debt	-	-	-0.042
			(0.406)
Constant	0.446	0.432	0.465
	(0.212)	(0.216)	(0.266)
Adj-R Sq	0.016	0.015	0.015
Obs.	642	642	642

In this analysis, the dependent variable is the efficiency internal capital market within a multi-segment firm in a particular year. The efficiency is calculated using the RVA method. The time period is between 2005 and 2010. *Crisis* takes the value of 1 if the reporting year is 2008 or later and 0 otherwise. All independent variables are discussed above. The regressions are estimated with fixed effects. Heteroskedasticity- and clustered-robust p-values are presented in parentheses. ***,**,* indicate significance at 1%, 5% and 10% level.

6.4.3. Evidence from Germany

In Table 6.12 we present our empirical results for Germany. As discussed above, Germany is a good example of a bank-based system and in contrast to market-based systems found in the UK and the US (Allen and Gale, 2000; Rajan and Zingales, 2003). As discussed above, a key distinction between the two systems is the significant role of banks in monitoring firms as well as their involvement in the firms' decision making process (Boot and Thakor, 1997; Tadesse, 2003; Chakraborty and Ray, 2006).

Similar to the prior sections, we examine the relationship between segments' investment and cash flow of other segments within the firm. Our results from the investment-cash flow model indicate that segments are not sensitive to the cash flow of other segments within the firm. We report the coefficient as 0.005 for *Other Cash*, statistically insignificant. This suggests that segments of diversified are more financially independent in Germany compared with segments of diversified in the UK and France. Instead, we find that segments in Germany are more sensitive to changes in own cash flow and sales growth.

Additionally, we investigate whether the crisis had an impact on the operation of internal capital markets by examining the interaction of the *Crisis* dummy variable with *Other Cash*. We find that this variable is negative during crisis, but insignificant at any significance level. This suggests that there were no significant changes in the investment policies of firms as the financial crisis began in 2008. Inactive or severely limited activity of internal capital markets suggests that a segment which experiences an adverse cash flow shock is likely to receive the full impact of that shock. Internal capital markets do not play a vital role in protecting segments' investments.

As an additional step, we perform the test separately for non-recession period and recession period. Our findings remain unchanged. Segments rely less on cash flow of other segments within the firm and more on their own cash flow. We report a positive but insignificant relationship between segment investments and cash flow of other segments within the firm before and during the crisis. This suggests that segments of a diversified firm are treated more like stand-alone firms and an increase in cash flow of one segment does not have any impact on the capital expenditure of other segments within the firm.

In addition, we report the coefficient of *Own Cash* as 0.090, statistically significant at 1 percent level. As discussed above, this is in line with segments own internal resources being the primary source of finance for investments. Furthermore, we examine the impact of the financial crisis on segments' investment and find that it appears to contract only in the year 2010, and not between 2008 and 2009 when the crisis was at its peak in Germany, as discussed in Chapter 5. It may be that firms close relationship with banks enabled the firm to obtain external finance more easily and continue investing. This indicates that firms in Germany experienced a lesser stringent environment compared with the UK during the crisis period.

Table 6.12

Investment-Cash Flow Sensitivity in Germany.

	(1)	(2)
Sales Growth	0.000**	0.000**
	(0.048)	(0.023)
Own Cash	0.090***	0.086***
	(0.000)	(0.000)
Other Cash	0.005	0.005
	(0.491)	(0.526)
Tobin's-Q	-0.000	-0.000
	(0.702)	(0.699)
Year 06	0.001	-
	(0.644)	
Year 07	0.000	-
	(0.702)	
Year 08	0.001	-
	(0.545)	
Year 09	-0.002	-
	(0.148)	
Year 10	-0.003***	-
	(0.009)	
Crisis		-0.002
		(0.276)
Crisis x Own cash	-	0.013
		(0.393)
Crisis x Other cash	-	-0.001
		(0.930)
Constant	0.017***	0.017***
	(0.000)	(0.000)
Adj. R-Sq	0.189	0.186
Obs.	3,805	3,085

This table shows the estimation results from the investment-cash flow model for Germany. The time period is between 2005 and 2010. In this analysis, the dependent variable is capital expenditure of segments normalised by firm assets at the beginning of the year. *Own Cash* and *Other Cash* are segment's own cash flow and cash flow other segments within the firm, respectively. *Tobin's-Q* is the proxy for segment investment opportunities and *Sales Growth* is the change in segment sales at the beginning of the year. The time dummy variables take a value of 1 and 0. *Crisis* takes a value of 1 if the reporting year is 2008 or later and 0 otherwise. The regressions are estimated with fixed effects. Heteroskedasticity- and clustered-robust p-values are presented in parentheses. ***,**,* indicate significance at 1%, 5% and 10% level.

As a next step, we examine the *industry-adjusted investment* and the *size* of internal capital markets within diversified firms. The results are presented in Table 6.13. It appears that the results are more in line with those reported for the UK than for France. For example, we find Tobin's-Q appears positive when the dependent variable is *industry-adjusted investment* as we report a coefficient of 0.021, statistically significant at 10 percent level. However, we find the coefficient of *Tobin's-Q* is significantly smaller during the crisis compared to the non-recession level. For example, we report a coefficient of 0.053 before the crisis and 0.015 in the recession period, statistically significant at 1 percent. Overall, this suggests investment opportunities are positively related to investment level of segments.

Additionally, we find that the Herfindahl Index appears positive and statistically significant in our analysis. This suggests that multi-segment firms that operate in related businesses allow their segments to invest more than industry average. Furthermore, smaller segments appear to invest more than larger segments of the firm. We find that the segment size variable appears negative and highly significant in our analysis. This finding is in line with prior literature arguing that larger segments usually subsidise the investments of smaller segments (Shin and Stulz, 1998).

In addition to this, segments that tend to invest more than industry average usually associated with large diversified firms. For example, we report the coefficient of *Firm Size* as 0.184, statistically significant at 1 percent level. Large firms are likely to have multiple segments which may range from small to large segments. In the presence of large segments, the firm may find it easier to shield the investments of smaller segments as their capital requirements are likely to be lower compared to the overall budget of the firm.

Table 6.13

Industry-adjusted Investments in Germany.

	All segments	Non-recession	Recession
Tobin's-Q	0.021*	0.053***	0.015***
	(0.075)	(0.001)	(0.005)
Herfindahl Index	0.048***	0.071**	0.007
	(0.005)	(0.023)	(0.689)
ROA	-0.057***	-0.157	0.042
	(0.000)	(0.228)	(0.170)
Log(Total Assets)	0.184**	-0.026	-0.089
	(0.011)	(0.931)	(0.676)
Log(Segment Assets)	-0.203***	-0.469	-0.098**
	(0.000)	(0.332)	(0.036)
Year 06	-0.196***	-0.164***	-
	(0.000)	(0.000)	
Year 07	-0.057**	-0.013	-
	(0.041)	(0.659)	
Year 08	-0.120***	-	-
	(0.000)		
Year 09	-0.034	-	0.096***
	(0.276)		(0.000)
Year 10	-0.021	-	0.109***
	(0.543)		(0.000)
Constant	-0.032	2.458	0.939
	(0.938)	(0.110)	(0.405)
Adj. R-Sq.	0.025	0.001	0.026
Obs.	3,503	1,713	1,411

In this analysis, the dependent variable is the industry-adjusted capital expenditure of segment. The time period is between 2005 and 2010. We take non-recession as 2005-2007 and recession period as 2008-2010. All independent variables are discussed above. The regressions are estimated with fixed effects. Heteroskedasticity- and clustered-robust p-values are presented in parentheses. ***,**,* indicate significance at 1%, 5% and 10% level.

Subsequently, we investigate the determinants of the size of internal capital markets in Germany. The results in Table 6.14 indicate that diversity and firm size are significant explanatory variables when the dependent variable is size of internal capital markets in Germany. For example, we report the coefficient of *Firm Size* as -0.368, statistically significant at 10 percent level. This suggests that smaller, possibly younger, firms appear to operate larger internal capital markets. Whereas, large firms are likely to have more well-established segments and may be treated like stand-alone firms.

Next, we examine the impact of the financial crisis and find that the crisis had a negative impact of the size of internal capital markets in Germany. This finding is similar to the results for the UK but opposite to the results reported for France. For example, we find that time dummy variables prior to the crisis are positive and significant, but negative and insignificant during the crisis period. This is in line with our findings from the univariate analysis indicating that internal capital markets operations declined significantly during the financial crisis. This suggest that managers were more cautious about taking up new investment projects by using cash flow of other segments within the firm.

Table 6.14

Size of Internal Capital Markets in Germany.

	(1)	(2)
Herfindahl Index	-0.000	-0.000*
	(0.123)	(0.065)
Cash Flow	0.399	0.451
	(0.293)	(0.255)
Log(Total Assets)	-0.280	-0.368*
	(0.163)	(0.076)
Short-Term Debt	-0.085	-0.088
	(0.825)	(0.819)
Long-Term Debt	-0.033	0.006
	(0.950)	(0.990)
Tobin's- Q	0.078	0.107**
	(0.190)	(0.045)
Year 06	0.210***	-
	(0.009)	
Year 07	0.011	-
	(0.883)	
Year 08	0.169*	-
	(0.055)	
Year 09	-0.009	-
	(0.902)	
Year 10	-0.019	-
	(0.819)	
Crisis	-	0.088
		(0.230)
Constant	1.810*	2.245**
	(0.097)	(0.048)
Adj. R-Sq.	0.005	0.014
Obs.	1,209	1,209

This table shows the estimation results from the regression analysis. In this analysis, the dependent variable is the size of an internal capital market within a multi-segment firm in a particular year. The time period is between 2005 and 2010. *Crisis* takes the value of 1 if the reporting year is 2008 or later and 0 otherwise. All independent variables are discussed above. The regressions are estimated with fixed effects. Heteroskedasticity- and clustered-robust p-values are presented in parentheses. ***,**,* indicate significance at 1%, 5% and 10% level.

Lastly, we examine the efficiency of internal capital markets by setting the dependent variable as *RVA.* The results are presented in Table 6.15. Our objective is again to determine whether size of internal capital markets affects the efficiency, as well as the impact of the financial crisis on efficiency. Firstly, we find some evidence that suggests firms that operate larger internal capital markets are more inefficient. We find that the coefficient of *ICM Size* is -0.005, statistically significant at 10 percent level. Secondly, we notice that the variable *Crisis* is negative but insignificant in our analysis. This result again suggests internal capital market efficiency does not improve during the crisis period in Germany.

Additionally, we find that *Cash Flow* is positive and significant when the dependent variable is *RVA*. We report the coefficient as 0.011, statistically significant at 10 percent level. This suggests that firms allocate resources more efficiently when they have larger cash flow. This may indicate the segments that have performed well in the past continue to receive more resources via internal capital markets.

Table 6.15

Efficiency of Internal Capital Markets in Germany.

	(1)	(2)	(3)
ICM Size	-0.005*	-0.005	-0.004
	(0.099)	(0.118)	(0.718)
Cash flow	0.011*	0.008	-0.000
	(0.010)	(0.699)	(0.988)
Log(Total Assets)	0.003	0.003	0.003
	(0.229)	(0.202)	(0.181)
Short-term debt	-0.009	-0.009	-0.000
	(0.566)	(0.537)	(0.997)
Long-term debt	-0.031	-0.031	-0.034
	(0.201)	(0.201)	(0.183)
Herfindahl Index	0.000	0.000	0.000
	(0.879)	(0.858)	(0.904)
Year 2006	0.004*	-	-
	(0.092)		
Year 2007	0.002	-	-
	(0.314)		
Year 2008	-0.001	-	-
	(0.563)		
Year 2009	-0.000	-	-
	(0.827)		
Year 2010	0.001	-	-
	(0.722)		
Crisis	-	-0.001	0.003
		(0.736)	(0.903)
Crisis x ICM Size	-	-	-0.006
			(0.160)
Crisis x Cash Flow	-	-	0.017
			(0.454)
Crisis x Short Term Debt	-	-	-0.020
			(0.175)
Constant	-0.010	-0.011	-0.011
	(0.365)	(0.335)	(0.352)
Adj-R Sq	0.007	0.003	0.010
Obs.	1,212	1,212	1,212

In this analysis, the dependent variable is the efficiency internal capital market within a multi-segment firm in a particular year. Efficiency is calculated using the RVA method. The time period is between 2005 and 2010. *Crisis* takes the value of 1 if the reporting year is 2008 or later and 0 otherwise. All independent variables are discussed above. The regressions are estimated with fixed effects. Heteroskedasticity- and clustered-robust p-values are presented in parentheses. ***,**,* indicate significance at 1%, 5% and 10% level.

6.4.4. Cross-Country Comparison

In this section, we present our empirical results from the regression analysis of pooled data for the three countries. As our primary objective is to determine the similarities and differences in internal capital markets operations and efficiency in the three countries in our analysis, we include country dummy variables in our analysis. The dummy variable *FR* takes a value of 1 if the firm is based in France and zero otherwise. Similarly, the dummy variable *DE* takes the values of 1 if the firm is based in Germany and zero otherwise. In this case, the reference point, or in this case, country is the UK.

As discussed in Section 6.2, the key advantage of using the fixed effects model is that it eliminates the unobserved characteristics that are constant over time. However, the country in which the firm operates in also remains fixed over time and, thus, its effects are eliminated. By including the country dummy alone, the variable is omitted from the analysis as it double accounts for country affects. However, for this part of the analysis our interest lies in the effect of this time constant variable (i.e. the country in which the firm is based) on the key time changing firm/segment characteristics and, therefore, we include the interaction term between the country dummy and time changing variables in our analysis.

We begin the analysis by examining the relationship between investment and cash flow of segments in these three countries. As discussed above, we are particularly interested in the relationship between segment's investment and cash flow of other segments within the firm. Our objective is to determine whether segments rely more or less on cash flow of other segments in France and Germany compared to the UK. Therefore, we include the interaction variable between *Other Cash* and *Country* in our analysis. The results are presented in Table 6.16.

In general, the findings indicate that segments do rely on cash flow of other segments for their investments. We report the coefficient of *Other Cash* as 0.051, statistically significant at 10 percent. This suggests that firms actively finance investment projects of segment using cash flow of other segments within the firm. This supports our earlier findings and it is consistent with the findings reported by Lamont (1997) and Shin and Stulz (1998). However, our earlier findings in Section 6.3.2 had indicated that segments rely less on cash flow of other segments for their investments in Germany, indicating limited role of internal capital markets.

We report the coefficient of variable *DE* x *Other Cash* as -0.042, significant at only 10 percent level which suggests that internal capital markets play a lesser significant role in allocating resources in Germany compared to the UK. This implies that a segment of a diversified firm in Germany which experiences an adverse cash flow shock is more likely to experience the full impact of that shock and internal capital markets perform a limited function to protect investment of segments with good opportunities. If internal capital markets are inactive then an important advantage of multi-divisional structure may not utilised.

Furthermore, we find that segments of diversified firms in France rely less on their own cash flow than segments of diversified firms in the UK. For example, we report the coefficient of variable *FR* x *Own Cash* as -0.071, statistically significant at 5 percent level. This indicates that internal capital markets in France are more successful at reducing investment-cash flow sensitivity of segments. On the other hand, we find no evidence to suggest that segments investment in the UK is more or less sensitive to its investment opportunities compared with other two countries.

Table 6.16

Investment-cash flow sensitivity in the UK, France and Germany.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Sales Growth	-0.000	0.000	0.000	0.000	0.000	0.000*	0.000**
	(0.968)	(0.555)	(0.681)	(0.725)	(0.193)	(0.058)	(0.046)
Own Cash Flow	0.077***	0.078***	0.081***	0.114***	0.110***	0.110***	0.107***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Other Cash Flow	0.028***	0.029***	0.033***	0.032***	0.054*	0.053*	0.051*
	(0.003)	(0.002)	(0.008)	(0.010)	(0.056)	(0.058)	(0.065)
Tobin's- Q	0.001	0.001**	0.001**	0.001**	0.001**	0.001***	0.001**
	(0.159)	(0.027)	(0.026)	(0.028)	(0.030)	(0.013)	(0.015)
Crisis	-	-0.003***	-0.002*	-0.002*	-0.002	-0.002	-0.003**
		(0.006)	(0.090)	(0.078)	(0.110)	(0.109)	(0.024)
Crisis x Own cash	-	-	-0.004	-0.004	-0.004	-0.004	-0.002
			(0.725)	(0.777)	(0.765)	(0.773)	(0.852)
Crisis x Other cash	-	-	-0.009	-0.001	-0.011	-0.011	-0.001
			(0.365)	(0.359)	(0.329)	(0.343)	(0.410)
FR x Own cash	-	-	-	-0.078**	-0.074**	-0.074**	-0.071**
				(0.011)	(0.020)	(0.020)	(0.022)
DE x Own cash	-	-	-	-0.026	-0.018	-0.017	-0.015
				(0.400)	(0.574)	(0.590)	(0.642)
FR x Other cash	-	-	-	-	-0.005	-0.004	0.000
					(0.872)	(0.891)	(0.999)
DE x Other cash	-	-	-	-	-0.045*	-0.044*	-0.042*
					(0.083)	(0.087)	(0.098)
FR x Tobin's-Q	-	-	-	-	-	-0.001	-0.001
						(0.323)	(0.392)
DE x Tobin's-Q	-	-	-	-	-	-0.001	-0.001
						(0.168)	(0.152)
FR x Crisis	-	-	-	-	-	-	0.002
							(0.120)
DE x Crisis	-	-	-	-	-	-	0.002
							(0.218)
Year 06	-0.002	-	-	-	-	-	-
	(0.214)						
Year 07	-0.000	-	-	-	-	-	-
	(0.793)						
Year 08	-0.000	-	-	-	-	-	-
	(0.782)						
Year 09	-0.004***	-	-	-	-	-	-
	(0.001)						
Year 10	-0.006***	-	-	-	-	-	-
	(0.000)						
Constant	0.016***	0.016***	0.015***	0.015***	0.014***	0.014***	0.015***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Adj. R-Sq	0.082	0.081	0.082	0.089	0.072	0.070	0.073
Obs.	9,180	9,180	9,180	9,180	9,180	9,180	9,180

This table shows the results from the investment-cash flow analysis for the UK, France and Germany. The time period is between 2005 and 2010. The variable *Crisis* takes the value of 1 if the reporting year is 2008 or later and 0 otherwise. The country dummy variables *FR* and *DE* take the value of 1 if the parent firm is based in France or Germany and 0 otherwise. The dependent variable is the capital expenditure of segment of diversified firm normalised by total assets of the firm at the beginning of the year. The independent variables are discussed above. The regressions are estimated with fixed effects. Heteroskedasticity- and clustered-robust p-values are presented in parentheses. ***,**,* indicate significance at 1%, 5% and 10% level.

As a next step, we examine the cross-country variation in the second measure of capital allocations, namely, the *industry-adjusted investment* of segments. The results are presented in Table 6.17. In general, we find that the financial crisis had a mixed affect on industry-adjusted investment of segments in the three countries in our analysis.

We find that segments of diversified firms in both France and Germany invest less compared to segments of diversified firms in the UK during the crisis. For example, we find that the *Crisis* x *FR* variable is negative and significant at 1 percent. On the other hand, the variable *Crisis* x *DE* is also negative and significant at only 10 percent, but we find that the coefficient is much smaller in Germany. This suggests that firms in market-based systems allow their segments to invest more by transferring resources via internal capital markets.

Additionally, our findings indicate that Tobin's-Q appears as a significant explanatory variable when the dependent variable is *industry-adjusted investment*. For example, we report the coefficient of the variable *DE* x *Tobin's-Q* as 0.019, statistically significant at 1 percent level. This suggests that diversified firms in Germany allowed more resources to be directed towards segments with good investment opportunities compared with the UK. On the other hand, we report the coefficient of the variable *FR* x *Tobin's-Q* as -0.053, statistically significant at 1 percent. This suggests that firms in France allowed more resources to be allocated to segments with weak investment opportunities compared with the UK. This is in line with our earlier findings reported in Section 6.3.2. In particular, firms in France do not appear to update their investment policies in response to the financial crisis and segments that were the receivers of resources prior to the crisis continued to receive resources during the crisis despite the decline in their investment opportunities.

Table 6.17

Industry-adjusted investment in the UK, France and Germany.

	(1)	(2)	(3)	(4)	(5)
Tobin's-Q	0.007***	0.007***	0.007***	0.007***	0.006***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Herfindahl Index	0.013	0.010	-0.047*	-0.040**	-0.062***
	(0.572)	(0.656)	(0.057)	(0.044)	(0.009)
ROA	0.002	0.002	0.002	0.000	0.000
	(0.496)	(0.499)	(0.494)	(0.871)	(0.934)
Log(Total Assets)	-0.089	-0.091	-0.090	-0.095	-0.107
	(0.305)	(0.296)	(0.300)	(0.274)	(0.222)
Log(Segment Assets)	-0.002	-0.003	-0.001	0.012	0.014
	(0.932)	(0.911)	(0.979)	(0.689)	(0.635)
Crisis	-0.057***	-0.061***	-0.062***	-0.060***	-0.016
	(0.000)	(0.000)	(0.000)	(0.000)	(0.168)
FR x Tobin's-Q	-	-0.042**	-0.042**	-0.042**	-0.053***
		(0.025)	(0.026)	(0.027)	(0.010)
DE x Tobin's-Q	-	0.019***	0.019***	0.019***	0.019***
		(0.000)	(0.000)	(0.001)	(0.000)
FR x HI	-	-	0.058	0.060	0.0105*
			(0.257)	(0.235)	(0.066)
DE x HI	-	-	0.069*	0.072*	0.078**
			(0.092)	(0.080)	(0.050)
FR x ROA	-	-	-	0.027	0.017
				(0.104)	(0.307)
DE x ROA	-	-	-	0.017	0.019
				(0.203)	(0.155)
FR x Crisis	-	-	-	-	-0.166***
					(0.000)
DE x Crisis	-	-	-	-	-0.029*
					(0.071)
Constant	0.515	0.535	0.529	0.481	0.534
	(0.190)	(0.175)	(0.179)	(0.226)	(0.180)
Adj. R-Sq.	0.001	0.002	0.002	0.001	0.006
Obs.	10,593	10,593	10,593	10,593	10,593

This table shows the estimation results from the regression analysis for multi-segment firms in the UK, France and Germany. The time period is between 2005 and 2010. The variable *Crisis* takes the value of 1 if the reporting year is 2008 or later and 0 otherwise. The country dummy variables *FR* and *DE* take the value of 1 if the parent firm is based in France or Germany and 0 otherwise. The dependent variable is the industry-adjusted investment of segment. The independent variables are discussed above. The regressions are estimated with fixed effects. Heteroskedasticity- and clustered-robust p-values are presented in parentheses. ***,**,* indicate significance at 1%, 5% and 10% level.

As a next step, we examine the similarities and differences in size of internal capital markets in the three countries as well as the impact of the financial crisis on its operations. In this analysis, our dependent variable is *Size*, which is a measure of cross-subsidisation of resources within the firm during a particular year, as discussed earlier. The results are presented in Table 6.18.

In line with our results in the prior sections, we find that size of internal capital markets significantly differs between the three countries. We find that internal capital market activity significantly increases in France compared to the UK during the financial crisis. For example, we report the coefficient of the variable *Crisis* x *FR* to be 0.419, statistically significant at 1 percent level. This suggests that firms in France make larger transfers of capital resources during the financial crisis.

In relation to this, we find that transfers of capital resources during the crisis are generally associated with weaker investment projects. For example, the coefficient of the variable *FR* x *Tobin's-Q* appears as -0.226, statistically significant at 1 percent level. This is again consistent with our results in the prior section indicating that firms in France did not appear to update their investment policies in response to the financial crisis or allocate more resources towards segments that are in financial difficulty.

On the other hand, we only find weak evidence which suggests that internal capital markets became more active in Germany compared to the UK. The finding of increased activity does not agree with our findings from the univariate analysis in Section 5.5 which indicated that size on cross-subsidisation significantly decreases in Germany. However, as UK is the reference point in the analysis, this result suggests that firms in the UK cutback significantly on transfers of capital resources during the crisis.

Table 6.18

The size of internal capital markets in the UK, France and Germany.

	(1)	(2)	(3)	(4)	(5)
Herfindahl Index	-0.000	0.026**	0.026***	0.025**	0.024***
	(0.754)	(0.011)	(0.010)	(0.011)	(0.006)
Cash Flow	0.110	0.113	0.217	0.178	0.207
	(0.679)	(0.670)	(0.264)	(0.329)	(0.253)
Log(Total Assets)	-0.011	-0.033	-0.012	0.004	0.049
	(0.951)	(0.855)	(0.950)	(0.981)	(0.792)
Total Debt	-0.015	-0.021	-0.023	0.020	-0.004
	(0.952)	(0.935)	(0.926)	(0.937)	(0.986)
Tobin's-Q	-0.013	-0.013	-0.012	0.036	0.008
	(0.784)	(0.776)	(0.789)	(0.209)	(0.777)
Crisis	0.128**	0.131**	0.128**	0.119**	-0.009
	(0.038)	(0.033)	(0.037)	(0.050)	(0.867)
FR x HI	-	-0.076	-0.067	-0.023	-0.003
		(0.352)	(0.426)	(0.796)	(0.974)
DE x HI	-	-0.026**	-0.026***	-0.025**	-0.024***
		(0.011)	(0.010)	(0.011)	(0.006)
FR x Cash flow	-	-	-1.953	-1.305	-1.303
			(0.147)	(0.324)	(0.320)
DE x Cash flow	-	-	0.476	0.257	0.231
			(0.238)	(0.539)	(0.581)
FR x Tobin's-Q	-	-	-	-0.326***	-0.226***
				(0.000)	(0.002)
DE x Tobin's-Q	-	-	-	0.082	0.107*
				(0.144)	(0.064)
FR x Crisis	-	-	-	-	0.419***
					(0.010)
DE x Crisis	-	-	-	-	0.099*
					(0.082)
Constant	0.337	0.467	0.349	0.222	-0.013
	(0.741)	(0.665)	(0.749)	(0.840)	(0.991)
Adj. R-Sq.	0.000	0.004	0.007	0.009	0.001
Obs.	3,456	3,456	3,456	3,456	3,456

This table shows the results from the regression analysis for multi-segment firms in the UK, France and Germany. The time period is between 2005 and 2010. The variable *Crisis* takes the value of 1 if the reporting year is 2008 or later and 0 otherwise. The country dummy variables *FR* and *DE* take the value of 1 if the parent firm is based in France or Germany and 0 otherwise. The dependent variable is the size of internal capital market within a diversified firm in a particular year. The independent variables are discussed above. The regressions are estimated with fixed effects. Heteroskedasticity- and clustered-robust p-values are presented in parentheses. ***,**,* indicate significance at 1%, 5% and 10% level.

As a final step, we investigate whether the efficiency of internal capital markets differs in three countries by setting the dependent variable as *RVA*. We present our results in Table 6.19. Prior research studies finds internal capital markets are generally inefficient and that they become more efficient during a recession (e.g. Hovakimian, 2011). We investigate whether efficiency improves in both bank- and market-based systems as the literature suggests. Our results in prior sections indicated the efficiency of internal capital markets improved in the UK but not in France or Germany. As before, we include country and time dummy variables in our analysis.

In line with our prior results, we find that efficiency improves significantly in the UK during the financial crisis compared with efficiency in France and Germany during the same period. We report the coefficient of *Crisis* x *FR* as -0.135, statistically significant at 1 percent level. Furthermore, we report the coefficient of *Crisis* x *DE* as -0.131, statistically significant at 5 percent level. The negative sign indicates that firms in France and Germany do not improve the efficiency of internal capital markets as much as firms in the UK during the financial crisis.

In general, our findings indicate that the financial system of a country plays a key role in determining the impact of the financial crisis on internal capital markets activity. Internal capital market operations tend to decrease in market-based systems as prior empirical literature suggests, however it increase significantly in France. In addition, this increase in activity is generally associated with lower efficiency in France. It may be that diversified firms in bank-based systems experienced lesser stringent environment and they did not respond to changes in the industry opportunities or firms used internal capital markets to support segments in distress regardless of their investment opportunities.

Internal capital markets add value when resources are efficiently allocated to finance value-enhancing investment projects (Stein, 2003), but destroy value if capital resources are misallocated (Rajan et al., 2000; Scharfstein and Stein, 2000). As multi-divisional structure allows diversified firms to pool resources from different segments, there is the possibility that management may misuse free cash flow (Jensen, 1986). In the event of a shock to its credit supply, such as during a recession, managers are put under more pressure to improve investment policies. However, if firms face less stringent environment then they are unlikely to be under similar pressure to improve.

Lastly, we find that the variable *Total Debt* appears negative and significant in our analysis. We report the coefficient as -0.379, statistically significant at 1 percent level. This may suggests that having too much debt forces large amount of capital resources out of the firm and, thus, leaves the firm unable to finance good investment opportunities. It may also be that managers bypass good investment opportunities to service corporate debt.

Table 6.19

Efficiency of internal capital markets in the UK, France and Germany.

	(1)	(2)	(3)	(4)
ICM Size	-0.039*	-0.028	-0.108	-0.108
	(0.091)	(0.123)	(0.463)	(0.463)
Cash flow	-0.028	0.066	0.072	0.083
	(0.867)	(0.549)	(0.534)	(0.484)
Log (Total assets)	0.062	0.091**	0.093**	0.099**
	(0.153)	(0.029)	(0.029)	(0.036)
Total Debt	-0.537**	-0.380***	-0.379***	-0.379***
	(0.043)	(0.000)	(0.000)	(0.000)
Crisis	0.029	0.116*	0.105*	0.106**
	(0.412)	(0.067)	(0.051)	(0.049)
FR x Crisis	-	-0.152**	-0.141***	-0.135***
		(0.013)	(0.008)	(0.010)
DE x Crisis	-	-0.146**	-0.132**	-0.131**
		(0.025)	(0.013)	(0.013)
FR x ICM Size	-	-	0.083	0.084
			(0.576)	(0.572)
DE x ICM Size	-	-	0.103	0.103
			(0.485)	(0.484)
FR x Log (Total Assets)	-	-	-	-0.148*
				(0.086)
DE x Log (Total Assets)	-	-	-	-0.030
				(0.434)
Constant	1.292**	0.447*	0.447	0.647**
	(0.036)	(0.092)	(0.106)	(0.012)
Adj-R Sq	0.331	0.260	0.253	0.306
Obs.	3,325	3,325	3,325	3,325

This table shows the results from the regression analysis for the UK, France and Germany. The time period is between 2005 and 2010. The variable *Crisis* takes the value of 1 if the reporting year is 2008 or later and 0 otherwise. The country dummy variables *FR* and *DE* take the value of 1 if the parent firm is based in France or Germany and 0 otherwise. The dependent variable is the efficiency of internal capital market of a diversified firm in a particular year. The independent variables are discussed above. The regressions are estimated with fixed effects. Heteroskedasticity- and clustered-robust p-values are presented in parentheses. ***,**,* indicate significance at 1%, 5% and 10% level.

6.5. Discussion on Control Variables

6.5.1. Own Cash Flow

Consistent with prior research, our findings indicate segment's investment is significantly sensitive to their own cash flow (Shin and Stulz, 1998). The coefficients of own cash flow are positive and statistically significant at 5 percent level or better in all three countries. It appears that although internal capital markets play an important role, segments still rely on their own cash flow for investment. Our results for France indicate that other cash flow is more important than own cash flow of segments for investment. Internal capital markets appear to be more successful at reducing segment's sensitivity to its own cash flow through internal cross-subsidisation of resources. Overall, we find that own cash flow is positive and significant which is in line with the theory and previous findings.

6.5.2. Segment and Firm Size

In general, the results show that the firm (segment) size has a positive (negative) effect on segments' investment level. Consistent with prior literature we find that the coefficient of firm size appears positive and significant in the UK and Germany. This is line with the theory as large firms are more likely to be well diversified and have many segments, as well as may be able to raise more finance from external markets for investment.

Secondly, it appears that smaller segments are more likely to be the receivers of internal resources as we find smaller segments tend to invest more than the industry average. Large diversified firms are more likely to have many segments, from small segments to very large segments and, thus, smaller segments are likely to be subsidised by cash flow of larger segments as their requirements for resources are also likely to be small compared to the budget of the firm. This is again in line with previous findings of Shin and Stulz (1998) and Scharfstein and Stein (2000) who find smaller segments are usually the receivers of internal resources while larger segments are usually making the transfer.

6.5.3. Diversity

We find that diversity, as measured by the Herfindahl Index, is negatively related to industry-adjusted capital expenditure in the UK. Our finding suggests that a segment of a highly diversified firm tends to invest more than industry average in the UK. In contrast, diversity appears to have the opposite impact on segment investment level in Germany. We find the coefficient is positive and significant, which suggests that segments of less diversified firms tend to invest more than industry average.

Additionally, the diversity of a firm has a significant impact on the size of internal capital markets in market-based and bank-based systems. In specific, the results show highly diversified firms are more likely to have larger internal capital markets in Germany. On the other hand, we find firms with segments operating in related industries operate larger internal capital markets in the UK. Firms in the UK appear to allocate more resources when divisions are in similar industries, whereas in Germany internal capital allocation is larger when divisions are in unrelated industries. This is an important distinction between the two countries and indicates a different managerial perspective on operating multiple divisions in unrelated industries within a firm.

6.5.4. Investment opportunities

We find that diversified firms pay attention to segment's investment opportunities when allocating resources. These results are similar to the results from the US indicating that capital expenditure of segments is sensitive to investment opportunities (Shin and Stulz, 1998). Internal capital markets can add value when good projects are financed using internal cash flow. Additionally, firms tend to pay more attention to segments' investment opportunities during the financial crisis.

A segment with good investment opportunities appears to invest more than industry average in the UK and Germany. However, we find that coefficient for investment opportunities appear negative and significant in France; indicating resources are flowing away from divisions with high-Tobin's-Q and towards divisions with low-Tobin's-Q. On further investigation, we find that this is more pronounced during the crisis period. This evidence is in line with our finding that efficiency of internal capital markets decreases in France but an increase in the UK during the recession. In addition, we find sales growth of a segment is a significant determinant of its investment level in Germany. In addition to this, our measure of segment profitability, the return on assets (ROA), appears positive but insignificant in most of the tests.

Our results from the regression analysis with pooled data for three countries shows that low-Tobin's-Q segments receive more capital allocations in France compared to the UK during the crisis. Overall, the effects of investment opportunities and sales growth on segment capital expenditure appear to be somewhat different across market- and bank-based systems. This highlights some important similarities and differences in multi-divisional firms and how they allocate resources internally.

6.6. Robustness Checks

In this section, we discuss the robustness of our results on the operations and efficiency of internal capital markets presented in earlier sections. The basic empirical strategy remains the same and the objective is to test the hypothesis in several ways. Our analysis proceeds in three main ways. Firstly, since asset sales may be a problem during the recessionary period as changes in the size of the segment could drive changes in capital expenditure, we focus on the ratio of investment to sales. Secondly, we use median values instead of averages to compute our industry adjusted measures for segments. Thirdly, we use segment return on assets to compute the efficiency of internal capital markets instead of Tobin's-Q.

6.6.1. Investment-Cash Flow Model

In Table 6.20, we present our findings from the investment-cash flow analysis for the three countries. In this analysis, the key variables are normalised by firm sales instead of total assets of the firm. As discussed in Section 6.2, internal capital markets can allow diversified firms to finance investment projects of a segment using the cash flow of other segments within the firm. In this case, we expect segments' investment to be sensitive to its own cash flow as well as the cash flow of other segments within the firm.

In line with the results reported in earlier sections, we find that segment investment is significantly sensitive to cash flow of other segments within the firm in the UK and France. Furthermore, we find that *Other Cash* appears positive; however it does not have significant explanatory power only for Germany. This suggests that segments in Germany rely more on their own cash flow for financing investment projects. Internal capital markets appear to play more significant role at allocating capital resources in the UK and France compared with Germany.

The impact of the recession on segment investment appears to be more significant in Germany compared with the other two countries. For example, we find that investment by segments of diversified firms decline significantly between 2009 and 2010 in Germany; however, this is not the case for UK and France. Interestingly, the variable for 2008 and 2009 are positively related to segment capital expenditures in France suggesting that they significantly increased investment during that period. For the UK, we find that *Crisis* variables are negative but do not have significant explanatory power.

Table 6.20

Investment-cash flow sensitivity.

	UK	France	Germany
Sales Growth	-0.001*	-0.000	0.000
	(0.099)	(0.133)	(0.782)
Own Cash	0.097***	0.429***	0.155**
	(0.000)	(0.014)	(0.034)
Other Cash	0.362*	0.312***	0.011
	(0.085)	(0.003)	(0.797)
Tobin's- Q	0.000	0.003	0.002
	(0.986)	(0.258)	(0.469)
Year 2006	-0.005	0.009	0.003
	(0.328)	(0.139)	(0.516)
Year 2007	-0.001	0.002	0.002
	(0.849)	(0.750)	(0.687)
Year 2008	0.021	0.015**	-0.001
	(0.422)	(0.024)	(0.830)
Year 2009	-0.020	0.013*	-0.008**
	(0.183)	(0.099)	(0.021)
Year 2010	-0.026	0.007	-0.009**
	(0.158)	(0.314)	(0.023)
Constant	0.006	-0.020	0.021***
	(0.805)	(0.243)	(0.000)
R-sq	0.032	0.194	0.103
Obs.	4,085	1,888	3,076

This table shows the estimation results from the regression analysis examining the investment-cash flow sensitivity in the UK, France and Germany. The time period is between 2005 and 2010. The dependent variable here is the capital expenditure of segment over total firm sales at the beginning of the year. *Own Cash* is cash flow of segments and *Other Cash* is cash flow of other segments within the firm. These variables are also normalised by total firm sales at the beginning of the year. Sales growth is change in sales of the segment at the beginning of the year. *Tobin's-Q* is the proxy for segment investment opportunities. The regressions are estimated with fixed effects. Heteroskedasticity- and clustered-robust p-values are presented in parentheses. ***,**,* indicate significance at 1%, 5% and 10% level.

6.6.2. Relative Value Added by Allocation

As a next step, we examine two other measures of capital allocation, namely, the *industry-adjusted investment* of segment and *firm- and industry adjusted investment* of segment. The findings are presented in Table 6.21. For this analysis we use the median industry investment instead of average values. Median values are likely to be less affected by any outliers that may affect the average. The variables are normalised by total assets of the firm.

In line with prior results, we find that segments with low Tobin's-Q appear to be allocated more resources than segments with high Tobin's-Q in France. For example, we find that variable *Tobin's-Q* is negative and significant in our analysis. On the other hand, *Tobin's-Q* appears to be positive and significant in Germany and the UK. This suggests that segments with good investment opportunities appear to invest more in Germany, but this is not the case in France. However, as our analysis indicated earlier, this appears to be the case during the crisis. Furthermore, we find that return on segment assets is negatively related to investments in the UK suggesting that less profitable segments invest more than high profitable segments of the firm.

These findings are in line with our prior results suggesting that internal capital markets appear to operate more efficiently in Germany. In addition, we find that segment (firm) size appears negative (positive) and significant when the dependent variable is industry-adjusted investment in the UK and Germany. This suggests that smaller segments of diversified firms are allocated more capital resources. In the presence of larger segments, smaller segments are able to invest more resources than if it was a stand-alone firm.

Table 6.21

Industry-adjusted investment of segments.

	UK		France		Germany	
	(1)	(2)	(1)	(2)	(1)	(2)
Tobin's- Q	-0.002	0.003*	-0.074**	-0.025*	0.008***	0.001
	(0.216)	(0.098)	(0.026)	(0.073)	(0.014)	(0.451)
Herfindahl Index	0.159***	-0.010	-0.003	-0.006	0.000***	-0.001
	(0.007)	(0.603)	(0.834)	(0.607)	(0.001)	(0.393)
ROA	-0.002***	-0.001**	0.002	-0.002	0.000	-0.000
	(0.004)	(0.041)	(0.771)	(0.375)	(0.358)	(0.701)
Log(Total Assets)	0.134***	0.016	0.172	0.013	0.103***	-0.007
	(0.005)	(0.530)	(0.401)	(0.921)	(0.006)	(0.830)
Log(Segment Assets)	-0.025*	0.018***	0.007	0.024	-0.024**	0.014
	(0.066)	(0.012)	(0.879)	(0.146)	(0.049)	(0.114)
Year 06	0.027**	0.010	-0.024	-0.009	0.021***	0.011**
	(0.038)	(0.248)	(0.340)	(0.600)	(0.005)	(0.035)
Year 07	-0.068***	-0.028**	-0.028	-0.024	-0.035***	-0.026
	(0.001)	(0.044)	(0.397)	(0.323)	(0.000)	(0.697)
Year 08	0.040***	0.005	-0.005	-0.016	-0.062***	-0.004
	(0.012)	(0.614)	(0.906)	(0.599)	(0.000)	(0.566)
Year 09	0.036***	-0.001	-0.148**	-0.052	0.036***	0.008
	(0.014)	(0.902)	(0.046)	(0.243)	(0.000)	(0.245)
Year 10	0.028*	0.008	-0.225	-0.080	0.048***	0.014*
	(0.087)	(0.479)	(0.026)	(0.213)	(0.000)	(0.060)
Constant	0.553**	-0.185	1.109	0.006	0.428**	-0.052
	(0.029)	(0.148)	(0.389)	(0.994)	(0.028)	(0.776)
Adj. R-Sq.	0.002	0.007	0.004	0.005	0.085	0.027
Obs.	5,229	5,229	1,861	1,861	3,311	3,311

In this analysis, the dependent variable is (1) industry-adjusted capital expenditure of segments or (2) the firm- and industry-adjusted capital expenditure of segments. The time period is between 2005 and 2010. The independent variables are same as above. The regressions are estimated with fixed effects. Heteroskedasticity- and clustered-robust p-values are presented in parentheses. ***,**,* indicate significance at 1%, 5% and 10% level.

As a next step, we compute the size of internal capital markets by taking the sum of subsidies and transfers of capital resources within diversified firms in a particular year. For this analysis, we use the investment of segments that have been adjusted using median industry values instead of average values. We present the results in Table 6.22. The dependent variable here is the *Size* of an internal capital market of a diversified firm in a particular year.

Our results are generally in line with the results reported in prior sections. For example, we find that internal capital market activity declines in the UK during the crisis period. The variable *Crisis* appears negative with a coefficient of -0.104 and statistically significant. On the other hand, we find that this variable appears positive for both France and Germany, but statistically significant only for France. In general, the results indicate that managers' cutback on cross-subsidisations of capital resources during the crisis period in the UK. This may be due to the falling sales and cash flow across segments, which then leads to fewer resources for reallocation at firm level. Furthermore, external capital constraints may also lead to fewer resources available for investment.

On the other hand, managers in France and Germany appear to use internal capital market channel to possibly support segments in distress during recession by increasing the cross-subsidisation of resources to weaker divisions. Internal capital markets appear to become more active during the crisis period compared to non-recession period. Furthermore, we find that firms that have high Tobin's-Q tend to operate larger internal capital market in Germany. This suggests that firms engage in cross-subsidisation of resources to take advantage of investment opportunities within a segment by using cash flow of other segments within the firm.

Table 6.22

Size of internal capital markets.

	UK	France	Germany
Herfindahl Index	0.001	0.018	0.000***
	(0.821)	(0.576)	(0.000)
Cash Flow	0.136	-0.639	0.013
	(0.190)	(0.345)	(0.915)
Log(Total Assets)	-0.062***	-0.315	-0.013
	(0.011)	(0.589)	(0.887)
Short-Term Debt	0.167	0.094	0.064
	(0.229)	(0.862)	(0.732)
Long-Term Debt	-0.154	-0.129	-0.278
	(0.259)	(0.774)	(0.127)
Tobin's- Q	0.016	-0.011	0.072***
	(0.177)	(0.766)	(0.002)
Inventory Turnover	0.000	-0.000	-0.000
	(0.454)	(0.395)	(0.046)
Crisis	-0.104***	0.113*	0.053
	(0.010)	(0.055)	(0.267)
Constant	0.517*	2.056	0.106
	(0.094)	(0.546)	(0.837)
Adj. R-Sq.	0.004	0.002	0.099
Obs.	1,602	645	1,209

This table shows the estimation results from the regression analysis for the UK, France and Germany. The dependent variable is the size of internal capital market within a multi-segment firm in a particular year. The time period is between 2005 and 2010. The regressions are estimated with fixed effects. Heteroskedasticity- and clustered-robust p-values are presented in parentheses. ***,**,* indicate significance at 1%, 5% and 10% level.

Finally, we investigate the efficiency of internal capital markets in the three countries in our analysis. For this analysis, we construct RVA by (i) using median industry values instead of average values (results presented in Table 6.23), and (ii) return on assets of segment (results presented in Table 6.24).

In general, the results support our previous finding that internal capital markets become more efficient during the crisis period in the UK. For example, the dummy variable for the year 2009 appears positive with a coefficient of 0.006 and statistically significant. This is in line with prior literature and suggests that managers improve capital allocation process when external credit becomes difficult to obtain such as during a recession (Hovakimian, 2011). This also supports the theory that in the presence of free cash flow managers are more likely to misallocate resources (Jensen, 1986). Thus, as cash flow declines during economic downturn, managers are put under more pressure to make more efficient capital allocations.

On the other hand, we find that this is not the case in France or Germany. For example, we find that the dummy variables for year 2008 and 2009 appear negative and significant for France. This indicates that efficiency of internal capital markets declines during the crisis in France. It may be that firms in France and Germany faced less stringent environment during the recession, and hence, managers were under less pressure to increase the efficiency of internal capital allocations. It may also be that firms were using internal capital markets to support financially weaker segments of the firms even when their investment opportunities continued to decline.

In addition, the size of internal capital markets is negatively related to the efficiency of internal capital markets. For example, the coefficient of the variable *Size ICM* appears negative for all countries in our analysis; however, it has significant explanatory power only in the case of France. This suggests that firms that operate larger internal capital markets tend to misallocate more capital resources.

Finally, the results in Table 6.24 also indicate that internal capital markets are more inefficient prior to the crisis in the UK and they become less inefficient during the crisis. On the other hand, we do not find any evidence to suggest this may be the case for France and Germany. In the case of Germany, we find that the dummy variable for the year 2006 is positive and significant indicating that managers allow segments high ROA to invest more than segments with low ROA. Additionally, the size of internal capital markets appears to have a negative sign for the case of UK and France; however, it fails to have any significant explanatory power.

Table 6.23

Efficiency of internal capital markets (Tobin's-Q).

	UK	France	Germany
Size ICM	-0.033	-0.003*	-0.022
	(0.347)	(0.099)	(0.200)
Cash flow	-0.002	0.037*	-0.996
	(0.939)	(0.059)	(0.147)
Log(Total Assets)	-0.033***	-0.003	-1.998
	(0.004)	(0.784)	(0.101)
Short-term debt	0.003	0.007	0.131
	(0.873)	(0.668)	(0.502)
Long-term debt	-0.040	-0.003	0.144
	(0.375)	(0.823)	(0.559)
Herfindahl Index	-0.092***	-0.002	0.000
	(0.000)	(0.264)	(0.598)
Year 2006	0.012	-0.003	0.025
	(0.362)	(0.141)	(0.333)
Year 2007	-0.001	-0.002	0.129
	(0.896)	(0.382)	(0.131)
Year 2008	-0.006	-0.006**	0.251
	(0.594)	(0.018)	(0.114)
Year 2009	0.006*	-0.008*	0.269
	(0.069)	(0.090)	(0.112)
Year 2010	0.009	-0.004	0.198
	(0.172)	(0.391)	(0.127)
Constant	0.243***	-0.050	11.270
	(0.000)	(0.465)	(0.101)
Adj-R Sq	0.511	0.016	0.014
Obs.	1,602	645	1,164

The dependent variable is efficiency of internal capital market of a multi-segment firm in a particular year. The time period is between 2005 and 2010. The dependent variable is RVA (Tobin's-Q as a proxy for segment investment opportunities) constructed using median industry values. The regressions are estimated with fixed effects. Heteroskedasticity- and clustered-robust p-values are presented in parentheses. ***,**,* indicate significance at 1%, 5% and 10% level.

Table 6.24

Efficiency of internal capital markets (ROA).

	UK		France		Germany	
	(1)	(2)	(1)	(2)	(1)	(2)
Size ICM	-0.000	-0.000	-0.000	-0.000	0.000	0.000
	(0.600)	(0.612)	(0.712)	(0.673)	(0.404)	(0.398)
Cash flow	0.001	0.001	0.001	0.001	0.004*	0.004*
	(0.312)	(0.353)	(0.853)	(0.771)	(0.063)	(0.098)
Log(Total Assets)	0.001	0.001	-0.005	-0.004	0.000	0.000
	(0.336)	(0.346)	(0.247)	(0.283)	(0.850)	(0.907)
Short-term debt	-0.001	-0.001	-0.003	-0.003	0.001	0.001
	(0.416)	(0.420)	(0.681)	(0.670)	(0.682)	(0.709)
Long-term debt	-0.001	-0.000	0.003	0.002	0.002	0.002
	(0.594)	(0.586)	(0.648)	(0.672)	(0.340)	(0.327)
Herfindahl Index	0.001	0.001	-0.001*	-0.001*	-0.000	-0.000
	(0.378)	(0.381)	(0.056)	(0.071)	(0.743)	(0.759)
Year 2006	-0.001**	-	-0.000	-	0.001*	-
	(0.040)		(0.999)		(0.097)	
Year 2007	-0.000	-	0.000	-	0.000	-
	(0.227)		(0.709)		(0.523)	
Year 2008	-0.000	-	-0.000	-	0.000	-
	(0.614)		(0.705)		(0.788)	
Year 2009	-0.000	-	-0.001	-	0.000	-
	(0.775)		(0.346)		(0.654)	
Year 2010	-0.000	-	-0.001	-	0.000	-
	(0.474)		(0.492)		(0.309)	
Crisis	-	0.000	-	-0.001	-	0.000
		(0.667)		(0.413)		(0.514)
Constant	-0.003	-0.003	0.028	0.025	-0.001	-0.001
	(0.340)	(0.354)	(0.220)	(0.255)	(0.696)	(0.762)
Adj-R Sq	0.004	0.004	0.002	0.002	0.006	0.003
Obs.	1,565	1,565	586	586	1,093	1,093

This table shows the efficiency of internal capital markets in three countries between 2005 and 2010. The dependent variable is the relative value added by allocation (RVA) calculated using return on segment assets instead of Tobin's-Q. All the independent variables are described above and remain the same. The regressions are estimated with fixed effects. Heteroskedasticity- and clustered-robust p-values are presented in parentheses. ***,**,* indicate significance at 1%, 5% and 10% level.

6.7. Summary

In this chapter, we examined the operation and efficiency of internal capital markets in two distinct financial systems, namely, the bank- and market-based financial system. Our objective is to determine (i) whether internal capital markets are active and efficient, (ii) impact of the financial crisis of 2008 on their operation and efficiency, and (iii) the similarities and differences in internal capital markets in bank- and market-based financial system.

We find that internal capital markets play a vital role in allocating capital resources within multi-segment firms in all three countries, although this is to a lesser extent in Germany. Furthermore, we find that internal capital market activity decreases in the UK during the financial crisis indicating that managers are more cautious about cross-subsidising capital resources to invest in new investment projects. On the other hand, we find that diversified firms in France increase the cross-subsidisation of resources during the financial crisis.

Our next research question aimed to explore the efficiency of internal capital markets in these three countries. We find that internal capital markets are inefficient in general, although this is to a lesser extent in France or Germany. This suggests that the supervisory role of banks (Rajan and Zingales, 2003) and their "hands-on" approach (Chakraborty and Ray, 2006) puts more pressure on managers to make better use of capital resources. Additionally, during the financial crisis multi-segment firms significantly improve their investment policies and allocate resources more efficiently in the UK. However, we find that this is not the case in France or Germany. In France, we find that the increase in the level of cross-subsidisation of capital resources during the crisis is related to lower efficiency.

In general, our findings indicate that internal capital market activity varies significantly between market- and bank-based systems. The crisis has a significant and positive effect on managers' productivity and putting them under more pressure to make better use of capital resources in market-based systems. However, this doesn't appear to be the case in bank-based systems. It may be that, due to close relationship with banks, firms' experienced less stringent environment in France and Germany and, therefore, faced less pressure to improve their investment policies. It may also be that firms used internal capital markets to support financially weaker segments of the firm even during the period when their investment opportunities continued to decline.

In the next chapter, we examine the link between internal capital markets and analysts' earnings forecast errors. In particular, we investigate whether the presence of internal capital markets increase firm complexity, which in turn, negatively affects the accuracy of the forecasts.

Chapter 7 – Analysts' Earnings Forecast Errors And Internal Capital Markets: Evidence From The Uk, France And Germany

7.1. Introduction

It has been well documented that analysts play a key role in promoting market efficiency by reducing the information asymmetries between firms' management and market participants (Hall and Tacon, 2010). As discussed in Chapter 5, financial analysts provide three key measures in their research reports, namely, earnings forecasts, buy/sell recommendations and target price. A number of studies document that markets react quickly to analysts' research reports and stock prices tend to move in the direction of the forecast (e.g. Kim, Lin and Slovin, 1997). For these reasons, the qualities of forecasts as well as the factors that may affect analysts' forecasting ability have received considerable attention in prior literature (Ramnath et al., 2008). In particular, the complexity of the firm has shown to be a significant factor of earnings forecasts errors (Duru and Reeb, 2002; Plumlee, 2003).

In this chapter, we investigate whether the presence of internal capital markets within diversified firms aggravate firm complexity and, thus, have an impact on analysts' earnings forecast errors. It is well documented that analysts value segment level information, and analyst coverage increases when firms disclose more information about their segments (Botoson and Harris, 2000). However, prior literature is silent on the relationship between internal capital markets and earnings forecast errors, and whether their presence can explain the forecast inaccuracy, bias and dispersion documented in prior literature.

In Section 7.2, we discuss our method for computing analysts' forecast accuracy, bias and dispersion. In Section 7.3 we discuss the basic model. Next, we present our results from the univariate analysis in Section 7.4. In Section 7.5, we present our findings from the multivariate analysis. Our results from the cross-country analysis are presented and discussed in Section 7.6. We discuss the robustness of our findings in Section 7.7. Finally, Section 7.8 concludes the chapter.

7.2. Method: Analysts' Forecast Errors

In this section, we discuss the method for computing the main variables for the analysis, namely, the accuracy of forecasts, bias embedded in these forecasts and dispersion in earnings forecasts. In particular, we examine three key estimates, namely, the 1-year earnings forecast, 2-year earnings forecast and long-term earnings growth forecast. As discussed in Chapter 5, we obtain the data on earnings forecasts from the I/B/E/S (Institutional Brokers Estimate System) and the firm- and segment-level data are obtained from Datastream. We obtain key data items for these estimates for our sample of firms in three countries in our analysis.[20]

For this analysis, we require firms to have at least three analysts following in a respective research year and estimates are available in the 3-4 months after the release of financial statements by the firm. The forecast errors are calculated at 3-4 months after the firms' fiscal year-end month. If the forecast information is not available then we exclude the firm from the analysis.

For example, for a firm with December as fiscal year-end month, we would require earnings estimates to be available between March-April in the following year. Also, if the firm year-end month is March, then we would require estimates between June-July. The 3-4 month lag is consistent with prior studies (Rajan and Sarvaes, 1997; Bradshaw et al., 2006) and we can be sure that analysts' have access to financial statements and sufficient time to absorb segment-level data and incorporate this information into their forecasts.

The Figure 7.1 below demonstrates this method by using a timeline of events. We use an example of a firm whose fiscal year-end month is December and analysts provide future

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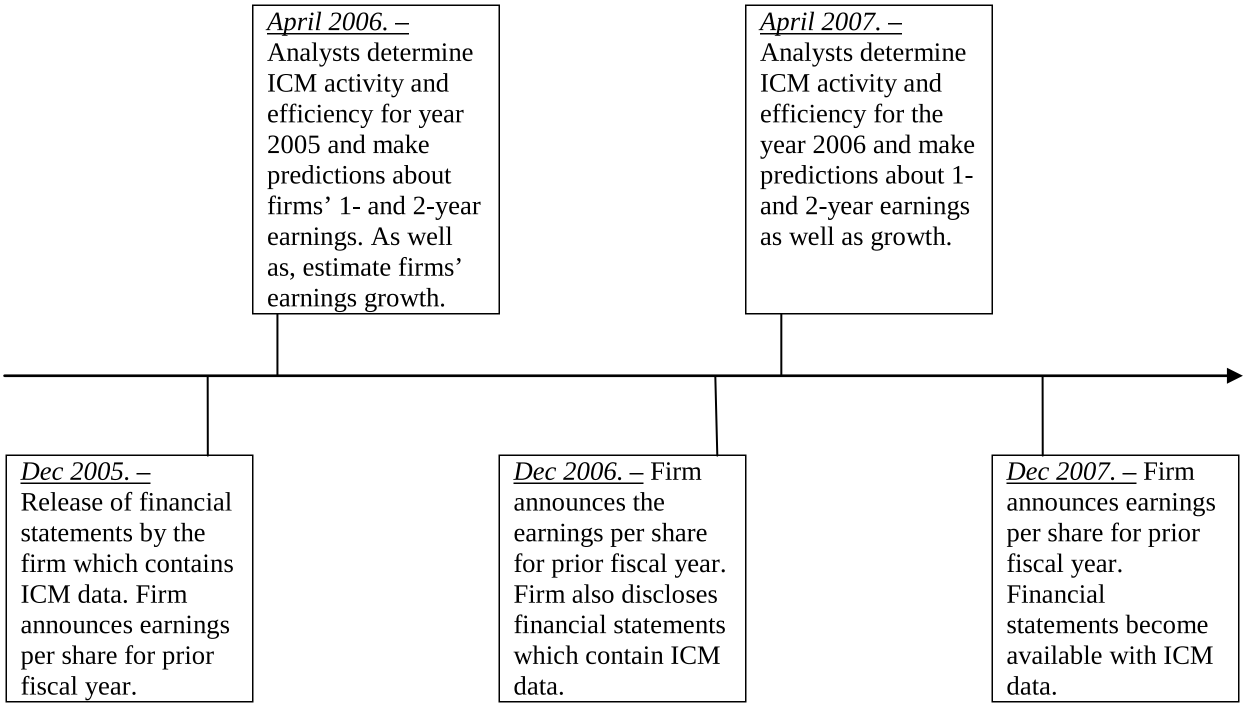
[20] We obtain the mean, median, minimum, maximum and standard deviation of 1-year, 2-year and LTG forecasts as well as the number of analysts following the firm. The analysts' variables we obtain from I/B/E/S represent the monthly consensus items.

earnings forecasts in April (*t+4 months*) using the internal capital markets data for the prior fiscal year (*t-1)*, such as the 1-year, 2-year and long-term growth (LTG) forecasts. The procedure is similar for firms whose fiscal month end is March or July. In the example given in Fable 7.1, the forecast error will be calculated at month *t+4* (i.e. April 2006) for the upcoming year(s).

Figure 7.1

Timeline.



As a first step, we follow Bradshaw et al. (2006) to compute the 1-year (FY1), 2-year (FY2) and long-term growth (LTG) forecast error variables. In terms of the long-term growth estimate, a five-year horizon is representative of what analysts' have in mind when these forecasts are made.[21]

FY1: This is the realised earnings per share for the upcoming year minus the monthly consensus forecast amount.

FY2: The realised earnings per share for the year after the upcoming year minus the monthly consensus forecast amount.

LTG: This variable is computed as the realised long-term growth minus the monthly consensus long-term growth forecast amount. The realised long-term growth is taken as the coefficient of an OLS regression of the natural log of earnings per share on a time trend. We require at least two actual reported earnings to be available to be able to compute realised growth in earnings per share.

As a next step, we follow Bradshaw et al. (2006) and Hilary and Hsu (2013) to compute the Accuracy, Bias and Dispersion in these forecasts. Similar to Bradshaw et al. (2006) we take the forecast error *at month 4* from the fiscal year month end of a firm. As a robustness check, we also take the *forecast at month 3* after firms' fiscal year end and compute the forecast errors (Rajan and Servaes, 1997).

[21] Thomson Financial, I/B/E/S Database.

Firstly, the *Accuracy* of the forecast is the absolute distance of the estimate from the actual earnings, normalised by stock price at the end of the month. This variable indicates the analysts' ability to make accurate predictions about the firms' future earnings. A number of studies have documented that ranked analysts are better able to process complex information (Plumlee, 2003) and issue more accurate forecasts.

Second, the *Bias* of the forecast is the signed error of the estimate from the actual earnings. It is obtained as realised earnings minus the forecast, normalised by stock price at the end of the month. Prior literature finds that analysts are generally optimistic about firms' performance (Bradshaw et al., 2006; Ramnath et al., 2008). Therefore, we expect the signed error to be negative in general indicating optimism about firms' future earnings performance. Jackson (2005) argues that only experienced investors are likely to be aware of systematic bias in forecasts and, hence, will be able to de-bias forecasts.

Third, we examine the *Dispersion* in earnings forecast. This variable is computed as the standard deviation of forecasts, normalised by stock price at the end of the month. A number of studies have normalised the standard deviation by absolute mean value of the forecasts for the month (Barron and Stuerke, 1998; Avramov et al., 2008) as well as stock price (Hope, 2010). We normalise the variable by stock price at the end of the month, and in our robustness analysis we use absolute mean value of the forecasts to normalise the variables.

Table 7.2

Analysts' forecast characteristics.

Forecast Error	Method
Accuracy	$\frac{\lvert Realised\ Earnings - \ Forecast \rvert}{Stock\ Price}$
Bias	$\frac{Realised\ Earnings - \ Forecast}{Stock\ Price}$
Dispersion	$\frac{Standard\ deviation}{\lvert Mean\ Forecast \rvert}$

This table shows the method for calculating the analysts' earnings forecast characteristics, namely, accuracy, bias and dispersion. The realised earnings is the actual earnings per share of a firm reported for the particular year. The forecast amount is the monthly consensus forecast (mean) amount. The forecast errors at calculated at t+4 month from the firms' fiscal year-end month. Stock price is the end of month price in which the forecast error is calculated. Standard deviation measures the dispersion in earnings forecasts supplied by analysts.

7.3. The Basic Model

In this section, we present and discuss the model we use to determine the relationship between internal capital markets and analysts' forecast errors. In particular, we extend the model mainly used in prior literature to investigate the link between forecast errors and external financing (e.g. Bradshaw et al., 2006) by including our internal capital markets variables. Our measures of internal capital markets operations and efficiency are discussed in detail in Chapters 5 and 6. Here we merely use the results from Chapter 6 and determine whether presence of internal capital markets increases firm complexity and, thus, affects analysts' forecast errors.

7.3.1. Forecast Errors and Internal Capital Markets

Prior empirical literature mainly uses regression analysis to determine the impact of key firm variables on forecast characteristics (e.g. Duru and Reeb, 2002; Bradshaw et al., 2006). For example, Duru and Reeb (2002) use accuracy and bias in earnings forecasts as the dependent variable and firm complexity measures as independent variables in their analysis. Similarly, Bradshaw et al. (2006) use the Fama-Macbeth regression analysis to investigate the link between analyst variables and external financing i.e. debt and equity.

In particular, Bradshaw et al. (2006) use forecast errors as dependent variable and external financing variables as independent variable, and find that equity and debt financing are highly significant. Equation (7.1) shows the relationship between the two variables. Bradshaw et al. (2006) also document that analysts' are generally optimistic in their forecasts about the future profitability of firms' that are involved in issuing debt or equity. Although the level of optimism is higher with equity financing compared with debt financing.

$$Analyst\ variable = \alpha + \beta.External\ Financing + \varepsilon \tag{7.1}$$

As our primary objective is to determine whether internal capital markets increase firm complexity and, in turn, affect analyst variables, we extend the model by including our measure of internal capital market activity and efficiency. Thus, our dependent variable is the *Accuracy*, *Bias* or *Dispersion* in earnings forecast. Additionally, the main independent variables under investigation are the size of internal capital markets (*Size ICM*) and their efficiency (*Efficiency ICM*). Our choice of control variables is guided by prior literature and availability of data.

Internal capital markets allow segments to overcome frictions associated with raising finance on external markets. However, the data on internal capital markets is static and their operations are imperfectly observable only at irregular intervals i.e. from the segment-level information in firms' annual or semi-annual reports. The lack of visibility to financing decisions made internally is likely to aggravate information asymmetry problems between firms' management and external market participants. In addition to this, it may increase firms' complexity and distort analysts' forecasts to a greater extent, especially if firms are operating large internal capital markets.

As discussed in Chapter 4, the complexity of the task is negatively related to accuracy and positively related to optimism and dispersion in earnings forecasts (Duru and Reeb, 2002; Plumlee, 2003). If internal capital markets aggravate complexity then we expect the extent of their operations and forecast accuracy to be negatively related. Furthermore, prior research finds that analysts are generally optimistic (Bradshaw et al., 2006) and the level of optimism rises with firm complexity. On the one hand, analysts may be more optimistic about firms' future performance if they believe firms' internal capital markets to be efficient. On the other hand, inefficient internal capital markets may be seen as value-diminishing and, therefore, associated with less optimism.

$$Analyst\ variable_{i,t} = \alpha + \beta_1.Size\_ICM_{i,t-1} + \beta_2.Efficiency\_ICM_{i,t-1} + \delta.X_{i,t} + \mu_i + \varepsilon_{i,t} \qquad (7.2)$$

In Equation (7.2), the dependent variable is the analysts' earnings forecast errors and *i* and *t* refer to firm and year respectively. $Size\ ICM_{i,t-1}$ and $Efficiency\ ICM_{i,t-1}$ are the size and efficiency of internal capital market of firm *i* in the last fiscal year *t-1*, respectively. Lastly, $X_{i,t}$ indicates the control variables in the analysis. Prior research has shown that external financing activity can have a significant impact on the analysts' forecast accuracy (Bradshaw et al., 2006). For example, analysts tend to be more optimistic about firms' future performance when it raises finance in external markets.

Therefore, we include net proceeds from issuing equity (ΔE) and net proceeds from issuing debt (ΔD) in our model as control variables. We calculate net proceeds from equity as net proceeds from sale/issue of common and preferred stock minus share buyback amount during the fiscal year minus cash dividends paid in total during the fiscal year. Similarly, net proceeds from debt are obtained from proceeds from long-term borrowing minus increase/decrease in short-term borrowing minus reduction in long-term debt. Both variables are normalised by total assets of the firm.

Earlier empirical studies also suggest that analysts tend to be more optimistic in their short- and long-term forecasts when firms raise finance from equity issuance. Debt financing is mainly related to higher optimism in the short-term forecasts. Increased debt level can force cash out of the firm and increase firm risk. We expect a negative relationship between external financing measures and *Bias* indicating that analysts are more optimistic when a firm issues debt or equity. We do not combine equity and debt financing proceeds in our model; this is because we are interested in their partial effect on analysts forecast accuracy.

Additionally, we follow Duru and Reeb (2002) to include Firm Size (natural log of total assets), Sales Growth and Investment (capital expenditure normalised by total assets). We also include Herfindahl Index in our model as a measure of diversity. We expect a positive relationship between accuracy of forecasts and firms' level of diversity. This is because if firms have operations in related business then the information complexity is likely to be less compared with firms that have operations in unrelated business lines. As a last step, we include time- and country-dummy variables in the model. As discussed in Chapter 5 and 6, we take the recessionary period between 2008 and 2010. In specific, we consider 2008 as early crisis, 2009 as mid-crisis and 2010 as late-crisis period. In the next section we present our findings.

7.4. Empirical Results

In general, our results indicate that the presence of internal capital markets has an effect on analysts' forecasts errors and this effect varies between countries. In line with our hypothesis on internal capital markets increasing firm complexity, we find that their level of operations negatively affect the accuracy of short-term forecasts in the UK. This suggests that firms that operate larger internal capital markets increase the complexity of information for analysts and, thus, reduce their ability to issue accurate forecasts. However, we do not find any evidence to suggest that this is the case in France or Germany.

Furthermore, we find that internal capital market operations are positively related to the level of dispersion in long-term growth forecasts in the UK. This suggests that analysts tend to disagree about the impact of internal capital market operations on long-term performance of the firm. On the other hand, we do not find this is the case in France or Germany. However, we do find some evidence which suggests that analysts are more optimistic about firms' performance when internal capital markets are efficient in Germany.

Lastly, our analysis indicates that analysts are generally optimistic about firms' performance, and this optimism significantly reduces during the financial crisis. We also find that accuracy declines and the level of dispersion increases during the recessionary period in all three countries. These findings highlight the general uncertainty among investors during the financial crisis. In the next subsection, we present and discuss our findings from the univariate and multivariate analysis.

7.4.1. Univariate Analysis

In this subsection, we examine the relationship between the analysts' earnings forecast errors and internal capital markets operations and efficiency. We present the analysis separately for each country in order to make a distinction between the three countries. As discussed above, our three analysts' forecast characteristics are accuracy, bias and dispersion. In particular, we focus on three estimates provided by analysts, namely, 1-year, 2-year and long-term earnings growth forecast.

7.4.1.1. Results from the UK

Table 7.3 presents descriptive statistics on analysts forecast characteristics for the UK. In general, we find more analysts provide short-term forecasts and fewer analysts provide long-term forecasts, and for this reason, our analysis on long-term growth forecasts is based on fewer observations. Similarly, Bradshaw et al. (2006) have almost 4 times as many short-term forecast observations than long-term growth forecast observations in their analysis. In general, our findings indicate that analysts appear to be more accurate with their short-term forecasts compared with long-term forecasts. For example, we find that the average (median) *Accuracy* for the 1-year forecasts is 0.040 (0.001) and for the long-term growth forecasts its 0.097 (0.070).

This may suggest that analysts are better able to incorporate information on factors that may affect firms' profitability in the short-term into their forecasts. Furthermore, the time period in our analysis captures the financial crisis of 2008 which may aggravate the long-term growth forecast errors. For example, declining sales, cash flow and investment opportunities during the recessionary period are likely to increase doubts on firm' future cash flows and profitability. The general uncertainty during the crisis, coupled with volatility in cash flows, may lead to greater forecasting complexity. This is in line with Haw et al. (1994) who document that as forecast complexity increases, analysts forecast accuracy declines.

As a next step, we examine the bias in earnings forecast and in line with prior literature we find that analysts are generally optimistic about firms' future performance. For example, we report the average (median) *Bias* in 1-year forecast and long-term growth forecast as -0.019 (-0.000) and -0.072 (-0.063), respectively. These results are in line with the findings of Dechow and Sloan (1997) and Bradshaw et al. (2006). In particular, Bradshaw et al. (2006) find optimism in analysts forecast in the US and report the average 1-year and 2-year earnings forecast error as -0.028 and -0.036, respectively.

Additionally, we examine the impact of the financial crisis on analysts' forecast bias and find optimism in earnings forecast significantly reduces during the crisis. For example, in the UK we find that average *Bias* in long-term growth forecast was around 0.087 before the crisis and it declines to 0.052 during the crisis, difference statistically significant at 1 percent level. We find no significant evidence to suggest that analysts' are more or less optimistic with the short-term earnings forecasts before and during the crisis in the UK, as we find insignificant change in 1-year or 2-year earnings forecast bias.

Lastly, we find that the *Dispersion* in analysts' forecasts increases as the time horizon of the forecast increases. We report the average (median) dispersion in 1-year and 2-year earnings forecast as 0.089 (0.055) and 0.162 (0.069), respectively. Similarly, we report average (median) dispersion as 0.640 (0.446) in long-term growth forecasts. This suggests that there is generally a greater level of disagreement amongst analysts about firms' long-term performance than short-term earnings. The increase in level of dispersion during the crisis is also likely to be aggravated by the uncertain economic environment during the financial crisis of 2008.

Table 7.3

Descriptive Statistics

		Mean	Median	Standard Deviation	Number of Observations	Number of firms
Accuracy	*FY1*	0.040	0.001	0.112	1,469	405
	FY2	0.049	0.014	0.098	1,469	405
	LTG	0.097	0.070	0.088	537	153
Bias	*FY1*	-0.019	-0.000	0.117	1,469	405
	FY2	-0.029	-0.003	0.105	1,469	405
	LTG	-0.072	-0.063	0.110	537	153
Dispersion	*FY1*	0.089	0.055	0.413	1,233	362
	FY2	0.162	0.069	0.179	1,204	356
	LTG	0.640	0.522	0.744	270	73

This table presents the forecast characteristics for the UK. FY1 and FY2 are the 1-year and 2-year earnings forecasts, respectively. LTG is the long-term earnings growth forecasts. Accuracy is the absolute distance between mean forecast and realised earnings. Bias is the signed error of the estimate from the actual earnings. Dispersion is the standard deviation in forecasts supplied by analysts over mean forecast. The forecast variables are constructed at firm-level and time period is between 2006 and 2011. The number of observations shows firm years.

Table 7.4 shows the relationship between analysts forecast characteristics and size of internal capital market within the firm. In particular, our objective is to determine whether analysts forecasts errors increase or decrease with the level the internal capital market activity within multi-segment firms. In general, we find that analysts tend to disagree more about firms' future performance when the firm operates larger internal capital market. We report a significant increase in *Dispersion* associated with higher level of internal capital markets operations. However, we do not find significant affect of internal capital market activity on forecast accuracy or bias.

Firstly, our results suggest that the level of dispersion in analysts' earnings forecasts increases as the size of internal capital markets increases in the UK. This is consistent with the idea that internal capital markets aggravate forecast complexity. As managers are not required to disclose information on intra-segmental cross-subsidisation of capital resources, it is likely to aggravate problems due to information asymmetry, and therefore, analysts may have differing opinions about the value creating aspect of such transfers of capital resources.

Secondly, we find only some evidence that suggests analysts are less optimistic about firms' future performance when the firm operates large internal capital market. For example, the average (median) bias in the 2-year forecast is -0.037 (-0.006) in the lower quartile (0-25%) and -0.028 (-0.002) in the upper quartile (75-100%), difference in median is statistically significant. This finding suggests that increase in the level of cross-subsidisation of resources reduces forecast bias. Similarly, we find that accuracy improves when firms operate larger internal capital markets; however, the results are statistically insignificant. This suggests that analysts expect multi-segment firms to shift resources between segments to some extent.

Table 7.4

ICM Activity and Forecast Errors in the UK.

	FY1	FY2	LTG
0-25%	0.046	0.059	0.095
	(0.012)	(0.021)	(0.065)
	[0.113]	[0.102]	[0.088]
25-50%	0.042	0.047	0.097
	(0.009)	(0.016)	(0.077)
	[0.122]	[0.096]	[0.078]
50-75%	0.037	0.046	0.094
	(0.009)	(0.014)	(0.066)
	[0.101]	[0.089]	[0.088]
75-100%	0.036	0.043**	0.010
	(0.006)[a]	(0.009)[a]	(0.070)
	[0.109]	[0.103]	[0.098]
Panel A			
Bias			
0-25%	-0.022	-0.037	-0.069
	(0.000)	(-0.006)	(-0.058)
	[0.120]	[0.111]	[0.011]
25-50%	-0.012	-0.023	-0.070
	(-0.001)	(-0.002)	(-0.071)
	[0.127]	[0.104]	[0.010]
50-75%	-0.018	-0.028	-0.069
	(-0.000)	(-0.002)	(-0.056)
	[0.106]	[0.096]	[0.011]
75-100%	-0.016	-0.032	-0.079
	(-0.000)[c]	(-0.002)[b]	(-0.058)
	[0.114]	[0.107]	[0.012]
Panel B			
Dispersion			
0-25%	0.137	0.076	0.754
	(0.052)	(0.060)	(0.404)
	[0.482]	[0.059]	[1.367]
25-50%	0.159	0.183	1.684
	(0.055)	(0.092)	(0.477)
	[0.439]	[0.645]	[7.495]
50-75%	0.125	0.338	2.005
	(0.053)	(0.076)	(0.511)
	[0.379]	[2.049]	[7.217]
75-100%	0.145	0.194***	0.844*
	(0.078)[a]	(0.069)[b]	(0.622)[a]
	[0.273]	[0.878]	[0.844]

This table shows the mean (median) and [standard deviation] of analysts' earnings forecast accuracy, bias (Panel A) and dispersion (Panel B). Internal capital markets variables are calculated between 2005 and 2010. Analysts' forecasts are calculated between 2006 and 2011. The 0-25 range indicates low ICM activity and 75-100 indicates high ICM activity. The mean (median) values marked *** (a), ** (b), * (c) shows 1%, 5% and 10%, respectively. This shows the difference in forecast errors of high and low internal capital markets operations.

7.4.1.2. Results from France

In Table 7.5 we present the descriptive statistics on analysts forecast characteristics for France. Similar to the findings for the UK, we find that accuracy of the forecast generally declines as the time horizon of the forecast increases. For example, we report the average (median) *Accuracy* is 0.047 (0.015) for the 1-year forecasts and 0.117 (0.073) for the long-term growth forecasts. This suggests that analysts are more accurate about firms' earnings in the short-term than its long-term performance.

Additionally, we find that analysts are more optimistic about firms' long-term performance compared with short-term performance. For example, we report the average (median) *Bias* in short-term forecasts as -0.015 (-0.002) and in long-term forecasts as -0.094 (-0.059). This is in line with the findings of Kang et al. (1994) suggesting that analysts' optimism increases with forecast horizon. Comparing the bias in 2-year forecast in the UK and France, we find that the average *Bias* is -0.030, and -0.033 for the UK and France, respectively. These results are very similar and suggest that there are little differences in analysts' optimism in firms based in these two countries.

In line with above findings, the level of dispersion amongst analysts appears to increase with the forecast time horizon. For example, we find that *Dispersion* increases from 0.244 (0.088) for 1-year forecast to 0.950 (0.585) for long-term growth forecast. Although there is a greater level of optimism in the long-term growth, there is also a higher level of variation in forecasts provided by analysts on firms' earnings growth.

Table 7.5

Descriptive Statistics.

		Mean	Median	Standard Deviation	Number of Observations	Number of firms
Accuracy	*FY1*	0.047	0.015	0.086	520	131
	FY2	0.064	0.030	0.094	520	131
	LTG	0.117	0.073	0.126	239	70
Bias	*FY1*	-0.015	-0.002	0.097	520	131
	FY2	-0.033	-0.014	0.109	520	131
	LTG	-0.094	-0.059	0.144	239	70
Dispersion	*FY1*	0.244	0.088	0.552	438	120
	FY2	0.211	0.114	0.344	435	120
	LTG	0.950	0.585	1.119	144	52

This table presents the forecast characteristics for France. FY1 and FY2 are the 1-year and 2-year earnings forecasts, respectively. LTG is the long-term earnings growth forecasts. Accuracy is the absolute distance between mean forecast and realised earnings. Bias is the signed error of the estimate from the actual earnings. Dispersion is the standard deviation in forecasts supplied by analysts. The forecast variables are constructed at firm-level and time period is between 2006 and 2011. The number of observations shows firm years.

Table 7.6 presents the analysts' forecast characteristics by the level of internal capital market activity. Unlike the findings from the UK, our results from France indicate that forecast accuracy declines and bias increases with the increasing internal capital market activity within the firm. For example, we find that long-term growth *Accuracy* increases from 0.010 (0.059) in the lower quartile to 0.121 (0.086) in the upper quartile. This is also the case with short-term forecasts. This suggests that internal capital markets increase the forecasting complexity and reduce accuracy (Duru and Reeb, 2002).

In addition, we find that *Bias* also increases in the long-term growth forecasts with the level of internal capital markets activity, however, it is statistically insignificant. For example, we find average (median) *Bias* in the 1-year forecasts in the lower quartile is -0.014 (-0.004) and in the upper quartile it increases to -0.033 (-0.006). This suggests that increase in complexity is generally associated with higher optimism in forecasts (Plumlee, 2003). Finally, unlike the findings from the UK which suggested internal capital market activity increase dispersion in forecasts, we find that the level of dispersion is higher in the inter-quartile range in France. This may suggest that analysts disagree on the level of cross-subsidisation of capital resources to finance investment projects within the firm.

Table 7.6

ICM Activity and Forecast Errors in France.

	FY1	FY2	LTG
0-25%	0.047	0.063	0.010
	(0.021)	(0.031)	(0.059)
	[0.067]	[0.091]	[0.117]
25-50%	0.047	0.066	0.131
	(0.012)	(0.028)	(0.088)
	[0.083]	[0.099]	[0.146]
50-75%	0.037	0.053	0.114
	(0.014)	(0.029)	(0.073)
	[0.064]	[0.073]	[0.124]
75-100%	0.059	0.073	0.121
	(0.017)	(0.033)	(0.086)
	[0.118]	[0.109]	[0.115]
Panel A Bias			
0-25%	-0.014	-0.021	-0.089
	(-0.004)	(-0.014)	(-0.052)
	[0.080]	[0.109]	[0.129]
25-50%	-0.008	-0.035	-0.093
	(-0.001)	(-0.009)	(-0.063)
	[0.095]	[0.114]	[0.172]
50-75%	-0.006	-0.037	-0.092
	(-0.000)	(-0.013)	(-0.047)
	[0.073]	[0.082]	[0.143]
75-100%	-0.033	-0.039	-0.102
	(-0.006)	(-0.020)	(-0.069)
	[0.129]	[0.126]	[0.131]
Panel B Dispersion			
0-25%	0.242	0.213	0.849
	(0.097)	(0.113)	(0.634)
	[0.689]	[0.318]	[1.066]
25-50%	0.187	0.219	2.614
	(0.086)	(0.106)	(0.757)
	[0.439]	[0.591]	[9.882]
50-75%	0.572	0.271	0.897
	(0.090)	(0.112)	(0.597)
	[3.133]	[0.763]	[1.255]
75-100%	0.279	0.231	0.957
	(0.124)	(0.127)	(0.630)
	[0.573]	[0.358]	[0.892]

This table shows the mean (median) and [standard deviation] of analysts' earnings forecast accuracy, bias (Panel A) and dispersion (Panel B). Internal capital markets variables are calculated between 2005 and 2010. Analysts' forecasts are calculated between 2006 and 2011. The 0-25 range indicates low ICM activity and 75-100 indicates high ICM activity. The mean (median) values marked *** (a), ** (b), * (c) shows 1%, 5% and 10%, respectively. This shows the difference in forecast errors of high and low internal capital markets operations.

7.4.1.3. Results from Germany

As a next step, we repeat the analysis and present descriptive statistics on analysts' forecast characteristics for Germany in Table 7.7. Similar to the results for the UK and France, we find that forecast accuracy tends to decline as the time horizon of the forecast increases. For example, we report the average (median) *Accuracy* is 0.069 (0.021) for the 1-year forecasts and 0.154 (0.110) for the long-term growth forecasts. This suggests that short-term forecasts issued by analysts are closer to actual reported earnings than long-term forecasts. We find that there does not appear to be significant difference in accuracy of forecasts issued by analysts for firms based in the three countries in our analysis.

However, we find that analysts are more optimistic about firms' long-term performance in Germany than in France or the UK. We find the average (median) *Bias* in long-term earnings growth forecast as -0.106 (-0.087). Similarly, we report the average (median) *Bias* in 1-year forecast as -0.033 (-0.004). The *Bias* in short-term forecasts in Germany is very similar to the 1-year *Bias* reported in the UK and France. Thus, it appears that analysts' were more optimistic about long-term performance of firms in Germany compared with firms in the UK and France.

In relation to this, we find that dispersion is also significantly higher for long-term forecasts in Germany than the UK or France. This suggests that there is wider disagreement amongst analysts and some analysts may be more optimistic about firms' future performance than others. For example, the average (median) *Dispersion* in the long-term forecast is 1.092 (0.647). Additionally, the average (median) dispersion in the 1-year and 2-year forecast is 0.297 (0.117) and 0.239 (0.125), respectively.

Table 7.7

Descriptive Statistics.

		Mean	Median	Standard Deviation	Number of observations	Number of firms
Accuracy	*FY1*	0.069	0.021	0.141	874	204
	FY2	0.075	0.039	0.097	874	204
	LTG	0.154	0.110	0.139	338	89
Bias	*FY1*	-0.033	-0.004	0.154	874	204
	FY2	-0.032	-0.016	0.118	874	204
	LTG	-0.106	-0.087	0.178	338	89
Dispersion	*FY1*	0.297	0.117	0.772	735	188
	FY2	0.239	0.125	0.740	726	184
	LTG	1.092	0.647	1.503	194	62

This table presents the forecast characteristics for Germany. FY1 and FY2 are the 1-year and 2-year earnings forecasts, respectively. LTG is the long-term earnings growth forecasts. Accuracy is the absolute distance between mean forecast and realised earnings. Bias is the signed error of the estimate from the actual earnings. Dispersion is the standard deviation in forecasts supplied by analysts. The forecast variables are constructed at firm-level and time period is between 2006 and 2011. The number of observations shows firm years.

Furthermore, in Table 7.8 we present the forecast characteristics by the level of internal capital market activity. In line with the results from France, we find that forecast accuracy declines with the increase in internal capital markets operations. We report the average (median) *Accuracy* for long-term growth as 0.018 (0.122) in the lower quartile and 0.147 (0.111) for the upper quartile, difference in average value is statistically significant. This suggests that internal capital markets operations increase forecasting complexity, which in turn, reduces forecast accuracy.

In addition to this, we find that *Bias* in short- and long-term growth forecast significantly increases with the size of internal capital markets in Germany. This is in line with the findings from France but in contrast to the findings from the UK. We report that the average *Bias* in short-term forecasts increases from -0.025 to -0.038 and for long-term forecasts it increases from -0.112 to -0.122 with increased internal capital market operations. This suggests that analysts are more optimistic about future performance of firms that operate larger internal capital markets in Germany.

Finally, we find that dispersion in the short-term forecasts appears to be positively related to the internal capital market activity. For example, for the *Dispersion* in 1-year forecasts increases from 0.299 to 0.667 with the level of internal capital markets operations. This result is in line with the findings reported for the other two countries and suggests analysts disagree to a greater extent about future performance of firms that operate larger internal capital markets. On the other hand, dispersion in long-term forecasts appears to be negatively related to internal capital market activity as we report 1.465 in the lower quartile and 1.124 in the upper quartile.

Table 7.8

ICM Activity and Forecast Errors in Germany

	FY1	FY2	LTG
0-25%	0.070	0.078	0.018
	(0.022)	(0.047)	(0.122)
	[0.142]	[0.100]	[0.158]
25-50%	0.068	0.073	0.122
	(0.021)	(0.034)	(0.087)
	[0.137]	[0.100]	[0.104]
50-75%	0.075	0.073	0.166
	(0.019)	(0.040)	(0.118)
	[0.155]	[0.092]	[0.156]
75-100%	0.065	0.074	0.147*
	(0.021)	(0.039)	(0.111)
	[0.129]	[0.098]	[0.122]
Panel A			
Bias			
0-25%	-0.025	-0.022	-0.112
	(-0.003)	(-0.014)	(-0.072)
	[0.156]	[0.125]	[0.213]
25-50%	-0.033	-0.040	-0.081
	(0.001)	(-0.018)	(-0.076)
	[0.149]	[0.117]	[0.136]
50-75%	-0.037	-0.024	-0.106
	(-0.007)	(-0.012)	(-0.095)
	[0.168]	[0.115]	[0.196]
75-100%	-0.038	-0.043	-0.122
	(-0.005)	(-0.020)	(-0.104)
	[0.139]	[0.114]	[0.155]
Panel B			
Dispersion			
0-25%	0.299	0.234	1.465
	(0.126)	(0.130)	(0.895)
	[1.017]	[0.473]	[1.737]
25-50%	0.755	0.232	0.922
	(0.109)	(0.127)	(0.608)
	[1.049]	[0.444]	[1.340]
50-75%	0.221	0.211	0.935
	(0.119)	(0.122)	(0.566)
	[0.344]	[0.414]	[1.324]
75-100%	0.667	0.275	1.124
	(0.111)	(0.119)	(0.628)[a]
	[1.842]	[1.252]	[1.168]

This table shows the mean (median) and [standard deviation] of analysts' earnings forecast accuracy, bias (Panel A) and dispersion (Panel B). Internal capital markets variables are calculated between 2005 and 2010. Analysts' forecasts are calculated between 2006 and 2011. The 0-25 range indicates low ICM activity and 75-100 indicates high ICM activity. The mean (median) values marked *** (a), ** (b), * (c) shows 1%, 5% and 10%, respectively. This shows the difference in forecast errors of high and low internal capital markets operations.

7.5. Multivariate Analysis

In this section, we present our results from the regression analysis on the relationship between analysts' forecast errors and internal capital markets. Our objectives are to determine (i) whether the operations of internal capital market have an impact on the earnings forecast errors, and (ii) the link between the efficiency of internal capital markets and earnings forecast errors.

Our main findings appear to suggest that internal capital markets have a limited impact on forecast characteristics and their effect varies from country to country. For example, we find evidence to suggest that internal capital markets operations are negatively related to accuracy and positively related to the level of dispersion in analysts' forecasts in the UK, but not in France or Germany. On the other hand, we find that internal capital markets efficiency has a greater impact on short-term bias in forecasts in France and Germany. Nevertheless, this evidence appears to suggest that internal capital markets aggravate firm complexity to some extent and have an effect on forecast characteristics.

As our objective is to determine the relationship between internal capital markets and analysts' forecast errors, the dependent variable in the regression analysis is the *Accuracy*, *Bias* or *Dispersion* in forecasts issued by analysts for firm j at time t. The internal capital market variables of firm j are measured at time $t\text{-}1$. We track the forecast errors and internal capital markets of a firm over a period of six years for the sample of diversified firms in our analysis. We allow firms to leave or enter our sample in the time period covered, however, we require firms to remain in the sample for at least two years.

Therefore, our analysis is based on panel data for the sample of diversified firms over a six year period. As discussed in Chapter 6, our analysis focusing on diversified firms only can present a number of issues. We address some of the key issues in the next few subsections. Subsequently, in Section 7.5.4 we begin with the discussion on our empirical results for the UK.

7.5.1. Multicolinearity

As a first step, we perform a number of tests which can enable us to detect the presence of multicolinearity. As discussed in Chapter 6, the Gauss-Markov assumption only requires that there should not be perfect linear relationship among independent variables. In that case, the coefficients will remain best linear unbiased estimators (BLUE). However, if there is perfect linear relationship or near perfect relationship among independent variables (i.e. close to one) then it is likely to cause statistical problems (Wooldridge, 2006).

Firstly, in Table 7.9 we present the results from the pairwise correlations which can identify high linear dependence amongst independent variables. Multicolinearity is more likely to be an issue when variables are computed from one or more of the independent variables within the model; however, it does not cause any problem in our analysis. We conclude that there is no high linear dependency amongst variables in our analysis.

Secondly, we perform the Variance Inflation Factors (VIF) test to determine whether near high multicolinearity is present (O'Brien, 2007). The findings are presented in Table 7.10. VIF measures how much the variance of the coefficients is inflated by multicolinearity and it is given by the Equation 7.3. As a rule of thumb, VIF of 1 will indicate no colinearity and a value greater than 10 will indicate high colinearity. We find that this is not an issue for our analysis.

$$VIF_j = \frac{1}{1 - R_j^2} \tag{7.3}$$

Table 7.9

Correlation Matrix

Panel A – UK											
	FY1-B	FY2-B	FY1-A	FY2-A	FY1-D	FY2-D	LTG-B	LTG-A	LTG-D	ICM-S	ICM-E
FY1-B	1	-	-	-	-	-	-	-	-	-	-
FY2-B	0.417	1	-	-	-	-	-	-	-	-	-
FY1-A	-0.839	-0.498	1	-	-	-	-	-	-	-	-
FY2-A	-0.408	-0.868	0.592	1	-	-	-	-	-	-	-
FY1-D	-0.109	-0.059	0.112	0.104	1	-	-	-	-	-	-
FY2-D	-0.205	-0.063	0.259	0.065	-0.215	1	-	-	-	-	-
LTG-B	-0.034	-0.082	0.081	0.066	-0.042	-0.025	1	-	-	-	-
LTG-A	0.003	-0.033	-0.004	0.033	0.046	0.052	-0.688	1	-	-	-
LTG-D	0.016	0.009	-0.013	-0.025	0.008	0.111	0.011	0.013	1	-	-
ICM- S	0.027	0.039	-0.043	-0.078	0.047	0.033	0.013	0.038	-0.041	1	-
ICM- E	-0.001	0.039	0.003	-0.362	0.037	0.069	-0.016	0.029	-0.031	0.133	1
Panel B – France											
FY1-B	1	-	-	-	-	-	-	-	-	-	-
FY2-B	0.409	1	-	-	-	-	-	-	-	-	-
FY1-A	-0.463	-0.231	1	-	-	-	-	-	-	-	-
FY2-A	-0.370	-0.526	0.623	1	-	-	-	-	-	-	-
FY1-D	-0.223	-0.051	-0.102	0.001	1	-	-	-	-	-	-
FY2-D	-0.179	-0.089	-0.037	0.012	0.054	1	-	-	-	-	-
LTG-B	0.010	0.062	-0.044	-0.026	0.024	0.021	1	-	-	-	-
LTG-A	0.009	-0.044	0.006	-0.014	-0.042	-0.077	-0.891	1	-	-	-
LTG-D	-0.223	-0.024	0.222	0.021	-0.014	-0.059	0.006	-0.007	1	-	-
ICM-S	-0.153	-0.146	0.139	0.125	0.161	0.176	0.129	-0.193	-0.032	1	-
ICM-E	0.054	0.033	-0.055	-0.044	-0.007	0.035	0.031	0.014	0.008	0.004	1
Panel C – Germany											
FY1-B	1	-	-	-	-	-	-	-	-	-	-
FY2-B	0.230	1	-	-	-	-	-	-	-	-	-
FY1-A	-0.606	-0.094	1	-	-	-	-	-	-	-	-
FY2-A	-0.281	-0.522	0.418	1	-	-	-	-	-	-	-
FY1-D	-0.045	0.039	0.081	0.009	1	-	-	-	-	-	-
FY2-D	-0.090	0.018	0.131	0.147	0.088	1	-	-	-	-	-
LTG-B	-0.049	-0.119	0.041	0.137	0.037	0.062	1	-	-	-	-
LTG-A	0.043	0.027	-0.025	-0.041	-0.069	-0.059	-0.631	1	-	-	-
LTG-D	-0.018	-0.057	0.012	0.032	0.046	0.082	0.229	0.019	1	-	-

ICM-S	-0.065	-0.066	-0.033	0.013	0.082	0.152	-0.007	-0.007	-0.042	1	-
ICM-E	-0.062	-0.132	0.045	0.132	0.043	0.117	0.027	-0.056	-0.026	0.268	1

This table shows the Correlation Matrix for the UK, France and Germany. The internal capital market variables are calculated between 2005 and 2010. Analysts’ earnings forecast errors are calculated between 2006 and 2011. FY1, FY2 and LTG represent 1-year forecast, 2-year forecast and long-term growth forecast, respectively. The variables marked with B, A and D represents forecast Bias, Accuracy and Dispersion, respectively. ICM is the internal capital markets variables and, variables marked with S and E represents the Size of internal capital markets and Efficiency of internal capital markets, respectively.

Table 7.10

Test for the presence of Multicolinearity.

	UK		France		Germany	
	VIF	1/VIF	VIF	1/VIF	VIF	1/VIF
ICM Size	1.18	0.849	1.40	0.713	1.46	0.686
ICM Efficiency	1.04	0.959	1.01	0.989	1.10	0.908
Sales Growth	1.15	0.868	2.02	0.495	1.20	0.836
Capex	2.08	0.481	2.67	0.375	2.10	0.477
HI	1.20	0.831	2.89	0.345	1.60	0.627
Δ Debt	1.08	0.928	1.34	0.748	1.13	0.887
Δ Equity	1.11	0.897	1.11	0.901	1.09	0.917
Firm Size	1.51	0.905	1.26	0.737	1.83	0.407
Year 2007	2.22	0.449	2.29	0.437	2.04	0.489
Year 2008	2.51	0.399	2.41	0.415	2.13	0.469
Year 2009	2.88	0.347	2.36	0.424	2.14	0.466
Year 2010	2.82	0.355	2.10	0.476	2.01	0.497
Year 2011	2.51	0.398	2.09	0.479	1.81	0.553
Mean VIF	1.79		1.91		1.66	

This table shows the Variance Inflation Factors (VIF) to determine whether multicolinearity is present in our data for the UK, France and Germany. The dependent variable in this analysis is the 1-year forecast accuracy. As a rule of thumb, a value greater than 10 represents high multicolinearity. We also perform this test for other models in our analysis and find that multicolinearity does not cause any issues in our analysis.

7.5.2. Heteroskedasticity

As a next step, we determine if heteroskedasticity is present in our data. In the presence of heteroskedasticty, the OLS estimates are no longer BLUE and standard errors are biased. We follow Cameron and Trivedi (1990) to perform the information matrix test and an orthogonal decomposition for heteroskedasticity, skewness, and kurtosis. We perform this test for the models discussed in Section 7.2. The White (1980) test for homoskedasticity against unrestricted forms of heteroskedasticity is usually similar to the first term of the Cameron-Trivedi decomposition.

The results are presented in Table 7.11. The findings show that heteroskedasticity is present in our dataset across the three countries. Thus, we correct for this by using the White's robust standard errors in all our regression tests.

Table 7.11

Test for Heteroskedasticity.

	UK			France			Germany		
	chi sq	*Df*	*P*	*chi sq*	*Df*	*p*	*chi sq*	*Df*	*P*
Heteroskedasticity	159.58	89	0.000	111.35	89	0.055	206.73	89	0.000
Skewness	42.17	13	0.001	46.73	13	0.000	52.41	13	0.000
Kurtosis	23.38	1	0.000	12.01	1	0.001	16.51	1	0.000
Total	225.13	103	0.000	170.09	103	0.000	275.66	103	0.000

This table shows the results from the information matrix test (Cameron-Trivedi decomposition) to determine whether heteroskedasticity is present in our data for the UK, France and Germany. The dependent variable in this analysis is the 1-year forecast accuracy. We perform this test when the dependent variable is Bias or Dispersion and find similar results.

7.5.3. Fixed effects Model

In this study, we use fixed effects model to estimate the coefficients and standard errors. Our panel data set of publicly listed firms consists of several firm characteristics and forecasts information obtained over a period of six years. Our primary objective is to determine the relationship between internal capital markets and earnings forecast errors. As discussed in Chapter 6, one of the important advantages of panel data is the ability to control for unobserved heterogeneity. In our analysis, we include a number of control variables which have been shown to have an impact on forecast errors in the prior literature. In addition to the several firm- and segment-level characteristics in our model, there may be other factors which could have an impact on forecast errors, such as ability or education level of analysts. Thus, there is potential for an omitted variable bias i.e. unobserved heterogeneity, which may be correlated with the explanatory variables and result in biased estimates.

In our analysis, we make use of the fixed effects method. The key advantage of using fixed effects method is that it allows us to eliminate the time-constant unobserved heterogeneity. Additionally, we conduct the Hausman Test (Hausman, 1978) to determine whether fixed effects or random effects should be used for the analysis. We find a large and significant Hausman statistic which indicates that a large and significant difference between the fixed and random effects estimation. Thus, we use fixed effects method as it appears to be more appropriate than random effects method.

Alternatively, prior empirical studies have also looked Fama-MacBeth estimates; however, this technique was developed to account for the correlation between observations on different firms in the same year, not to account for the correlation between observations on the same firm in different years (Petersen, 2008). Many authors have acknowledged the bias and proposed adjustments to estimating the correlation (for example, Fama and French, 2002). In general, prior empirical studies find that the adjusted standard errors in Fama-MacBeth estimates produce similar results to OLS cluster-robust standard errors (Petersen, 2008).

In the presence of both time effect and firm effect, we include time dummy variables within the model and estimate the standard errors on the other dimension, i.e. cluster by firm. By allowing unobserved effects to be arbitrarily correlated with the explanatory variables in each time period, the purpose of the time dummy variables is to remove the correlation between observations in the same time period. Prior empirical studies have shown that in such a case the standard errors clustered by firm are unbiased (Petersen, 2008).[22]

Our analysis focuses on the relationship between internal capital markets and forecast errors and, hence, we mainly focus on diversified firm, as single segment firms do not operate internal capital markets (Kuppuswamy and Villalonga, 2010). Sample selection issues can arise when the information or observations are from a non-random sub-sample of the population of interest. There are two common approaches to this problem are Heckman (1976) two-step estimator and Propensity Score Matching (PSM) estimator.

The first approach involves estimation of a probit model for selection and calculation of the inverse Mills ratio, and then inserting this correction factor into the OLS model of interest (Bushway et al., 2007). In the PSM analysis, the first step is to consider the variables that determine the participation (i.e. diversification) which will characterise the selection model. Then estimate the propensity score, which are often obtained by logit or probit functions. The propensity-score is the probability that a firm in the complete sample is diversified, given a set of variables.

[22] Petersen (2008) shows that when there are only a few clusters in one dimension, clustering by the more frequent cluster yields results that are almost identical to clustering both by firm and time.

However, the implementation of such method requires significantly rich data, which may limit their usage. For example, obtaining the propensity scores requires matching the treated with untreated units taking into account (i) matching with or without replacement, (ii) proximity, (iii) weight cases and, (iv) number of comparison units matched to each treatment unit. Depending the matching criteria selected the following matching algorithms may be applied; (i) nearest neighbour matching, (ii) radius matching and, (iii) kernel and local-linear matching. The advantage for fixed effects models is that sample selection is only a problem when selection is related to the idiosyncratic errors (Wooldridge, 2002). Also, Imai and Kim (2011) find results that suggest the fixed effects and matching estimators do not fundamentally differ in their ability to cope with endogeneity in observational studies.

7.5.4. Evidence from the UK

In Table 7.12 we present the results from the regression analysis examining the relationship between analysts' earnings forecast characteristics and internal capital markets in the UK. The results indicate that there is some evidence to suggest higher internal capital market activity leads to less accurate forecasts in the short-term. For example, we find that when the dependent variable is *1-year Accuracy* the variable *ICM Size* has coefficient of 0.005, statistically significant at 5 percent level. This suggests that it becomes more difficult to make accurate estimates about future performance of a firm that engages in greater cross-subsidisation of resources. When firms increase their internal capital market activity, their actual earnings deviate more from than the estimated earnings.

Furthermore, we include the interaction variable between the size of internal capital markets and crisis period. We find the variable *Crisis x ICM Size* appears negative and significant when the dependent variable is *1-year Accuracy*. For example, we report the coefficient of this variable as -0.015, statistically significant at 5 percent level. This suggests that firms that operate smaller internal capital markets during the crisis period tend to have higher short-term forecast error. The results from the prior chapter indicated that firms significantly cut back on the size of internal capital markets during the financial crisis in the UK. The negative relationship we observe between short-term accuracy and internal capital markets operations during the crisis may be due to the uncertainty about the type of projects that are going to be financed via internal capital markets. It may also be that analysts expect firms to use internal capital markets more during the crisis to support weaker segments.

We do not find that this is the case for long-term growth forecast accuracy. The internal capital market variables appear insignificant in the analysis. This suggests that internal capital markets operations do not appear to have a significant impact on the accuracy of long-term growth forecasts. Additionally, there is no significant evidence to suggest that presence of internal capital markets has an impact on bias in the forecasts. It may be the case that analysts consider internal capital markets to perform a limited role and their presence do not have significant impact. However, there is some evidence to suggest that analysts are more optimistic about future performance of firms that operate larger internal capital markets during the crisis. For example, we report the coefficient of the variable *Crisis x ICM Size* as 0.019, statistically significant at 5 percent level when the dependent variable is *1-year Bias*.

In relation to this, we find that internal capital markets have a significant impact on the level of dispersion in analysts' long-term forecasts. For example, when the dependent variable is *Dispersion LTG* we report the coefficient of the variable *ICM Size* as 1.173, statistically significant at 1 percent level. Similarly, when the dependent variable is *2-year Dispersion,* the coefficient of *ICM Size* is 0.135, statistically significant at 10 percent level. This suggests that there is more disagreement amongst analysts about the future profitability of firms with increasing internal capital markets operations.

Some of the findings from this analysis are in line with our hypothesis and suggest that the internal capital markets within diversified firms can increase forecasting complexity and, in turn, reduce accuracy, which can also lead to a greater disagreement amongst analysts about the future performance of the firm. This is because, in addition to the presence of internal capital markets, the direction of capital resources transfers may be more difficult to predict. Although efficient internal capital market theory promotes the use of capital resources to finance good investment opportunities, our analysis in Chapter 6 indicated that capital resources are generally misallocated in multi-segment firms.

Table 7.12

Analysts' Forecast Errors and ICM in the UK.

	Accuracy			Bias			Dispersion		
	1-year	*2-year*	*LTG*	*1-year*	*2-year*	*LTG*	*1-year*	*2-year*	*LTG*
ICM Size	0.005**	0.002	-0.562	-0.002	-0.002	0.738	0.257	0.135*	1.173***
	(0.019)	(0.201)	(0.130)	(0.321)	(0.414)	(0.152)	(0.112)	(0.065)	(0.002)
ICM Efficiency	0.001	0.000	-0.476	-0.001	-0.000	-2.116	-0.008	0.001	-1.194
	(0.299)	(0.759)	(0.620)	(0.236)	(0.577)	(0.144)	(0.431)	(0.969)	(0.112)
Firm size	0.073***	0.045	-1.372	-0.080***	-0.069**	3.544	0.938	1.413***	-9.484
	(0.009)	(0.111)	(0.683)	(0.008)	(0.040)	(0.535)	(0.112)	(0.002)	(0.276)
HI	-0.004	-0.000	0.097	0.005	0.008	0.323***	-0.099***	-0.018	-0.155*
	(0.253)	(0.742)	(0.105)	(0.185)	(0.276)	(0.004)	(0.001)	(0.565)	(0.062)
Δ Debt	-0.029	0.012	2.556	0.010	-0.009	-4.726	-0.019	0.777*	1.264
	(0.223)	(0.548)	(0.224)	(0.703)	(0.670)	(0.147)	(0.982)	(0.096)	(0.444)
Δ Equity	-0.000	-0.000	0.004	0.000	-0.000	0.005	-0.000	0.000	0.000
	(0.110)	(0.998)	(0.551)	(0.653)	(0.803)	(0.739)	(0.768)	(0.896)	(0.931)
Capex	0.236**	0.109	-13.589	-0.247*	-0.134	41.313	6.419	7.315	-35.542
	(0.045)	(0.153)	(0.470)	(0.094)	(0.122)	(0.198)	(0.215)	(0.179)	(0.256)
Sales Growth	0.009	0.001	3.302	-0.009	-0.003	0.238	0.209	0.228	-5.792
	(0.252)	(0.885)	(0.136)	(0.294)	(0.653)	(0.947)	(0.214)	(0.101)	(0.010)
Crisis	0.011	0.012	-1.113	-0.006	-0.003	4.997***	0.459***	0.458	3.867
	(0.256)	(0.236)	(0.369)	(0.557)	(0.774)	(0.003)	(0.004)	(0.012)	(0.133)
Crisis x ICM	-0.015**	-0.001	1.753	0.019**	-0.007	0.748	-0.191	-0.042	-0.704
Size	(0.033)	(0.866)	(0.141)	(0.034)	(0.431)	(0.572)	(0.228)	(0.814)	(0.507)
Crisis x	-0.002	-0.000	-3.930	0.002	0.001	-0.442	0.029	0.019	-0.915
Efficiency	(0.183)	(0.737)	(0.287)	(0.155)	(0.550)	(0.922)	(0.141)	(0.409)	(0.755)
Constant	-0.402**	-0.226	19.701	0.459***	0.378*	-35.643	-4.178	-7.278***	65.753
	(0.011)	(0.149)	(0.375)	(0.007)	(0.041)	(0.350)	(0.172)	(0.008)	(0.250)
R-Sq.	0.038	0.015	0.040	0.025	0.018	0.092	0.030	0.047	0.133
Obs.	1,469	1,469	531	1,469	1,469	531	1,234	1,204	271

This table shows the estimation results from the regression analysis examining the relationship between internal capital markets and analysts' earnings forecast errors in the UK. The dependent variable in this analysis is accuracy, bias or dispersion. The analysts' forecast errors are between 2006 and 2011. Crisis takes a value of 1 if the reporting year is 2008, 2009 or 2010 and 0 otherwise. Internal capital market variables are measured between 2005 and 2010. All regressions are estimated with fixed effects. ***, ** and * represent 1%, 5% and 10% significant level.

7.5.5. Evidence from France

As a next step, we repeat the analysis for firms in France and present the regression results in Table 7.13. The dependent variable in our analysis is the *Accuracy*, *Bias* or *Dispersion* in the analysts' forecasts. As before, the main variables of interest are the internal capital market size and efficiency.

In general, we find a positive and significant relationship between dispersion in long-term earnings forecast and internal capital markets operations. Similar to the findings for the UK, we report the coefficient of *ICM Size* as 1.270, statistically significant at 10 percent level. This suggests that the level of disagreement amongst analysts about firms' long-term growth is higher when firms operate larger internal capital markets. It may be the case that internal capital markets are considered to play an important role in mainly financing long-term investment projects of the firm and analysts tend to disagree more about their impact on the long-term profitability of the firm.

In relation to this, although we find that the coefficient of *ICM Size* is positive when the dependent variable is *Dispersion* in *1-year* and *2-year* forecasts, however, it does not have significant explanatory power. Thus, the impact of internal capital markets operations on the level of dispersion in short-term forecasts appears to be limited. Additionally, we do find some evidence which suggests that the size internal capital markets has an impact on the level of dispersion in the short-term forecasts during the crisis in France. For example, we report the variable *Crisis x ICM Size* as negative and significant when the dependent variable is *1-year* and *2-year Dispersion*. This suggests that internal capital markets operations are negatively related to the level of dispersion in short-term forecasts during the financial crisis.

Unlike the findings for the UK, we find no significant evidence to suggest internal capital markets have an impact on the accuracy or bias in France. Although, the internal capital market variables have the same sign in our analysis for the UK and France, they appear to be insignificant in all the tests for France. This suggests that internal capital markets operation and efficiency do not affect the forecast errors in the same way across countries, and it may also be that analysts are better able to incorporate internal capital market information into their forecast in France.

Interestingly, we find that efficiency of internal capital markets is negatively related to long-term growth forecast accuracy in France. This suggests that firms that are efficient have smaller forecast errors compared to firms that are inefficient. As we expected, efficient internal capital markets can provide a signal about the internal workings of the firm and analysts anticipate firms to efficiently allocate capital resources, the forecasts are more accurate. When firms misallocate resources and finance less profitable segments, their actual earnings tend to deviate more from the estimated earnings.

Table 7.13

Analysts' Forecast Errors and ICM in France

	Accuracy			Bias			Dispersion		
	1-year	*2-year*	*LTG*	*1-year*	*2-year*	*LTG*	*1-year*	*2-year*	*LTG*
ICM Size	0.008	0.008	-0.874	-0.006	-0.011	0.958	0.084	0.045	1.270*
	(0.211)	(0.443)	(0.374)	(0.497)	(0.450)	(0.553)	(0.206)	(0.168)	(0.099)
ICM Efficiency	-0.063	-0.036	-53.040**	0.032	0.055	59.225	-0.295	0.329	2.869
	(0.350)	(0.659)	(0.048)	(0.673)	(0.665)	(0.224)	(0.530)	(0.529)	(0.879)
Firm size	-0.011	0.132*	-18.480	-0.127	-0.193**	15.976	-0.069	0.223	-15.288**
	(0.843)	(0.061)	(0.311)	(0.103)	(0.021)	(0.479)	(0.802)	(0.379)	(0.020)
HI	0.008	0.003	0.586	-0.007	0.016	-1.252	-0.068	-0.086	0.059
	(0.205)	(0.629)	(0.736)	(0.581)	(0.114)	(0.485)	(0.383)	(0.221)	(0.939)
Δ Debt	0.017	-0.016	-3.645	-0.027	-0.033	5.242	0.389	0.283	11.392
	(0.562)	(0.552)	(0.686)	(0.670)	(0.419)	(0.581)	(0.107)	(0.134)	(0.146)
Δ Equity	0.000	0.000	0.048*	-0.000	-0.000	-0.011	-0.002*	-0.003***	0.061
	(0.582)	(0.178)	(0.062)	(0.908)	(0.144)	(0.769)	(0.061)	(0.003)	(0.252)
Capex	-0.323*	0.029	-40.895	0.303	-0.269	125.215	1.374	1.509	-79.147
	(0.069)	(0.807)	(0.585)	(0.288)	(0.167)	(0.175)	(0.287)	(0.170)	(0.071)
Sales Growth	-0.006	-0.007	-1.967	-0.002	-0.013	1.622	0.015	0.063	-1.034
	(0.555)	(0.443)	(0.785)	(0.862)	(0.246)	(0.829)	(0.826)	(0.408)	(0.673)
Crisis	0.046***	0.024*	4.866**	0.008	0.019	-2.462	0.229**	0.147*	2.222
	(0.002)	(0.096)	(0.033)	(0.612)	(0.878)	(0.314)	(0.025)	(0.095)	(0.294)
Crisis x ICM	-0.011	-0.012	1.434	-0.004	-0.002	0.232	-0.148**	-0.119**	-0.948
Size	(0.105)	(0.294)	(0.136)	(0.646)	(0.878)	(0.876)	(0.037)	(0.027)	(0.172)
Crisis x	0.082	0.063	51.231	-0.031	-0.019	-38.451	0.711	0.299	5.916
Efficiency	(0.307)	(0.551)	(0.171)	(0.750)	(0.887)	(0.448)	(0.180)	(0.474)	(0.772)
Constant	0.99	-0.781*	134.304	0.765	1.194**	-120.295	0.579	-1.169	109.695**
	(0.768)	(0.071)	(0.262)	(0.107)	(0.019)	(0.417)	(0.741)	(0.454)	(0.013)
R-Sq.	0.108	0.081	0.101	0.049	0.139	0.099	0.049	0.124	0.118
Obs.	518	518	239	518	518	239	438	435	144

This table shows the estimation results from the regression analysis examining the relationship between internal capital markets and analysts' earnings forecast errors in France. The dependent variable in this analysis is accuracy, bias or dispersion. The analysts' forecast errors are between 2006 and 2011. Crisis takes a value of 1 if the reporting year is 2008, 2009 or 2010 and 0 otherwise. Internal capital market variables are measured between 2005 and 2010. All regressions are estimated with fixed effects. ***, ** and * represent 1%, 5% and 10% significant level.

7.5.6. Evidence from Germany

In Table 7.14, we present our findings from the regression analysis examining the analysts' earnings forecast errors and internal capital markets in Germany. Similar to the analysis for other countries, we examine three forecast characteristics, namely, the *Accuracy*, *Bias* and *Dispersion* in earnings forecasts in Germany.

In general, our results indicate that internal capital markets efficiency has a significant impact on all three characteristics for the short-term forecasts. For example, when the dependent variable is the *Accuracy 1-year* and *2-year* forecasts we find that *ICM Efficiency* variable appears as -0.048 and -0.046, respectively. The results are significant at 5 percent level or better. This suggests that as the efficiency of internal capital markets improve, the forecast accuracy tends to increase. This is in line with the results for France and suggest that analysts anticipate firms to efficiently allocate resources. Efficient firms are more likely to signal good internal governance and fewer resources being misallocated e.g. due to rent-seeking activities compared with inefficient firms.

In line with this finding, our results indicate that analysts are more optimistic about future performance of firms that operate more efficient internal capital markets. For example, when the dependent variable is *Bias* in short-term forecasts, the *ICM Efficiency* variables are negative and statistically significant. As discussed in Section 7.2, a negative value of variable *Bias* indicates optimism and positive value indicates pessimism. This suggests that efficient investment policies of the firm have a positive and significant impact on the analysts' expectations on the internal workings of the firm and its long-term profitability.

In addition, we find some evidence to suggest that more efficient internal capital markets are negatively related to the level of dispersion in the short-term forecasts. For example, when the dependent variable is the *Dispersion* in *1-year* forecasts, the coefficient of the variable *ICM Efficiency* appears as -0.107, statistically significant at 5 percent level. This suggests that when internal capital markets are inefficient there is higher level of disagreement amongst analysts regarding the future performance of the firm. Inefficient internal capital markets are likely to signal severe internal governance failures, misallocation of resources and rent-seeking activities by division managers. When the internal problems are severe, it may be more difficult to accurately forecast the future profitability of the firm.

Unlike the results for the UK, we find no evidence to suggest that the size of internal capital markets has any significant impact on the accuracy of the earnings forecasts in Germany. This suggests that either the internal capital market operations are very limited and do not have considerable impact on firms' future profitability. Although, we find that *ICM Size* appears positive when the dependent variable is *Dispersion* in *1-year*, *2-year* or *LTG* forecasts, we find that the variable is insignificant in almost all the tests. This indicates that the presence of internal capital markets has no significant impact on the level of disagreement amongst analysts about the future performance of the firm.

Table 7.14

Analysts’ Forecast Errors and ICM in Germany.

	Accuracy			Bias			Dispersion		
	1-year	*2-year*	*LTG*	*1-year*	*2-year*	*LTG*	*1-year*	*2-year*	*LTG*
ICM Size	-0.007	-0.007	-0.297	0.007	0.011*	1.122	0.003	0.014	0.651
	(0.300)	(0.116)	(0.814)	(0.227)	(0.086)	(0.559)	(0.851)	(0.434)	(0.350)
ICM Efficiency	-0.048**	-0.046***	-7.922	-0.056*	-0.035***	14.480	-0.107**	0.050	15.496
	(0.026)	(0.000)	(0.885)	(0.074)	(0.008)	(0.808)	(0.018)	(0.203)	(0.533)
Firm size	0.169**	0.074**	6.183	-0.185*	-0.189***	-3.799	0.672**	0.435**	11.608
	(0.021)	(0.014)	(0.316)	(0.067)	(0.000)	(0.779)	(0.019)	(0.031)	(0.199)
HI	-0.013***	0.002	0.360	0.012***	-0.004	-1.274	0.016	0.006	1.233
	(0.000)	(0.486)	(0.836)	(0.000)	(0.117)	(0.599)	(0.539)	(0.627)	(0.251)
Δ Debt	-0.019	0.053*	7.931	-0.033	-0.056	4.984	-0.141	-0.086	6.869*
	(0.730)	(0.073)	(0.332)	(0.496)	(0.312)	(0.580)	(0.207)	(0.356)	(0.090)
Δ Equity	-0.001	0.000	0.053	-0.001	-0.001**	0.009	-0.002	-0.002	0.007
	(0.528)	(0.699)	(0.638)	(0.591)	(0.027)	(0.957)	(0.654)	(0.251)	(0.936)
Capex	0.052	-0.069	-34.953	-0.221	-0.059	7.887**	0.896	0.797	-20.171
	(0.695)	(0.315)	(0.105)	(0.101)	(0.504)	(0.049)	(0.111)	(0.190)	(0.274)
Sales Growth	-0.012	-0.008	-1.472	0.008	0.005	7.865	-0.206	-0.084	-7.236***
	(0.225)	(0.255)	(0.674)	(0.548)	(0.607)	(0.109)	(0.159)	(0.333)	(0.004)
Crisis	0.026	0.015	-1.762	-0.016	0.018	11.372***	0.094***	0.094***	4.284*
	(0.144)	(0.122)	(0.443)	(0.456)	(0.240)	(0.002)	(0.003)	(0.003)	(0.085)
Crisis x ICM	0.003	0.006	-0.543	-0.004	0.001	-10119	0.004	-0.016	1.586
Size	(0.765)	(0.387)	(0.775)	(0.755)	(0.931)	(0.706)	(0.915)	(0.561)	(0.538)
Crisis x	0.033	0.056	-62.156	-0.021	0.127	15.131	-0.127	0.049	14.552
Efficiency	(0.872)	(0.702)	(0.338)	(0.934)	(0.596)	(0.886)	(0.865)	(0.922)	(0.841)
Constant	-0.922**	-0.366**	-20.077	1.062*	1.076***	15.747	-3.783**	-2.396**	-68.868
	(0.029)	(0.034)	(0.605)	(0.068)	(0.000)	(0.846)	(0.025)	(0.043)	(0.218)
R-Sq.	0.085	0.064	0.045	0.046	0.113	0.138	0.178	0.099	0.230
Obs.	874	868	337	868	868	337	735	726	194

This table shows the estimation results from the regression analysis examining the relationship between internal capital markets and analysts’ earnings forecast errors in Germany. The dependent variable in this analysis is accuracy, bias or dispersion. The analysts’ forecast errors are between 2006 and 2011. Crisis takes a value of 1 if the reporting year is 2008, 2009 or 2010 and 0 otherwise. Internal capital market variables are measured between 2005 and 2010. All regressions are estimated with fixed effects. ***, ** and * represent 1%, 5% and 10% significant level.

7.5.7. Discussion on Control Variables

In this subsection, we discuss the significance of various control variables in the analysis on analysts' earnings forecast errors. In particular, we discuss the impact of the size of the firm, performance as well as diversity on forecast characteristics. Furthermore, we also discuss the impact of the financial crisis of 2008 on forecasts.

7.5.7.1. Firm Size

Duru and Reeb (2002) document that, on the one hand, firm size is likely to indicate high complexity, and thus, reduce the forecast accuracy, but on the other hand, more pre-disclosure information is usually available for larger firms, which could also lead to higher forecast accuracy. Furthermore, larger firms are more likely to be well-known in their respective industry and, therefore, have greater analyst coverage providing more information to market participants. We include firm size as the natural log of total assets of the firm in our analysis. In general, we find that firm size is negatively related to short-term forecast accuracy in all three countries in our analysis. For example, we report the variable *Firm Size* to be positively and significantly related to accuracy of short-term forecasts, which suggests that larger firms have higher forecast error.

This is in line with prior literature and suggests that larger firms are likely to be more complex which, in turn, leads to lower accuracy (Brown, 1993; Duru and Reeb, 2002). Large firms are also likely to have more segments in related as well as unrelated industries compared to smaller firms, which can aggravate task complexity and lower accuracy (Duru and Reeb, 2002; Plumlee, 2003).

In relation to this, we find some evidence to suggest firm size leads to higher dispersion in the UK and Germany, but this is not the case in France. For example, we report the variable *Firm Size* as positive and significant when the dependent variable is *Dispersion* in the UK and Germany; however, this variable is insignificant in our analysis for France. This is line with the discussion above and suggests that firm size is positively related to task complexity, and higher analyst coverage may lead to higher level of dispersion.

7.5.7.2. Diversity

It is now well acknowledged that firms operating in multiple industries can increase firm complexity and this can lead to lower forecast accuracy. For example, Dunn and Nathan (2000) suggest that industrial diversification can lead to lower forecast accuracy. In this analysis, we include Herfindahl Index and find that there is some evidence to suggest firms that have operations in unrelated industries have lower short-term forecast accuracy in Germany. However, we find that this is not the case in France or the UK.

We find some evidence which indicates firms that have segments in unrelated industries have higher dispersion in the short-term forecasts. Additionally, we find that firms operating in related industries have higher *Bias* (overoptimistic) in short-term forecasts in Germany. This finding suggests that analysts anticipate firm that have related operations to be more profitable in the future. On the other hand, this does not appear to be the case for firms in France or the UK as we find that the variable *HI* does not have any significant explanatory power.

7.5.7.3. External Financing

Prior literature documents that the decision to raise finance on the external market can signal potential as well as opposing effect. For example, on the one hand, firm may raise finance to take advantage of good investment opportunities. On the other hand, a number of studies have shown that firms raise finance when management consider their stock to be overvalued (Myers and Majluf, 1984).

Furthermore, raising finance on external markets can be costly. It has been well documented that analysts affiliated with investment banks usually issue more optimistic forecasts in order to gain more business e.g. advisory fees and commissions associated with debt or equity issues (Barber et al., 2007). Similarly, Bradshaw et al. (2006) documents a strong positive relationship between firms' decision to raise finance on the external markets and optimism in analysts' earnings forecasts. For equity transactions, optimism extends to long-term forecasts as well short-term forecasts.

We include proceeds from debt and equity finance as control variables in our analysis. In general, we only find some evidence to suggest change equity is related to increased optimism in the short-term forecasts in Germany. However, this variable is mainly insignificant for the other two countries in our analysis. Also, we find that there is only some evidence to indicate change in debt lowers the accuracy of the forecast in the short-term.

7.5.7.4. Firm Performance

A number of studies have documented that a significant change in firms' performance can have an impact on the analysts' earnings forecasts (Brown et al., 1987; Lang and Lundholm, 1996; Gu and Wu, 2001). In our analysis, we include two key measures which can indicate recent significant change in level of performance of the firm, namely, sales growth and investment. Sales growth is the sales at *t-1* minus sales at *t-2* divided by sales at *t-2*. Investment is the capital expenditure normalised by total assets of the firm. In general, we find little evidence to suggest that analysts' earnings forecast errors are driven by firm performance variables. We find that these variables are insignificant in all the three countries in our analysis.

7.5.7.5. Financial Crisis

A number of studies have documented that forecast time horizon is negatively related to forecast accuracy (Brown, 1993; Duru and Reeb, 2002). According to I/B/E/S, a 5 year period is what analysts have in mind when they issue long-term growth forecasts. The time period in our study covers the financial crisis of 2008, and hence, we include time dummy variables to study the impact of the crisis on earnings forecast characteristics.

We find that short- and long-term forecast accuracy declines significantly during the recessionary period in France. For example, when the dependent variable is *1-year Accuracy* we report the coefficient of the variable *Crisis* as 0.046, statistically significant at 5 percent level. This suggests that forecasting complexity increases during the financial crisis which, in turn, reduces the accuracy of the forecasts.

In addition to this, we find a positive and significant relationship between *Dispersion* in short- and long-term forecasts and the financial crisis variable in Germany. For example, when the dependent variable is *Dispersion* in *1-year* forecasts, we report the coefficient of the variable *Crisis* as 0.094, statistically significant at 1 percent level. This also indicates that forecasting complexity increases during the crisis, which then leads to a higher level of disagreement amongst analysts about firms' short-term and long-term performance.

7.6. Cross-Country Analysis

In this section, we present our findings from the pooled data for three countries in our study and repeat the analysis. Table 7.15 shows the results from the regression analysis examining the relationship between analysts' forecast errors and internal capital markets in the UK, France and Germany.

7.6.1. Accuracy

Firstly, our findings suggest that internal capital markets operations in Germany have a less significant impact on forecast accuracy compared with the UK. For example, when the dependent variable is *1-year Accuracy* we report *DE x ICM Size* as -0.019, statistically significant at 5 percent level. This is in line with the results reported in prior section and indicates that internal capital markets increase complexity and reduce forecast accuracy in the UK, but this does not appear to be the case in Germany.

Secondly, firms with more efficient internal capital markets are associated with higher forecast accuracy in Germany compared with the UK. For example, when the dependent variable is *1-year Accuracy*, we report *DE x ICM Efficiency* as -0.045, statistically significant at 5 percent level. This appears to be in line with findings reported in the previous section and suggests that internal capital markets efficiency as well as the signal it provides about the internal workings of the firm play a role in determining future profitability of the firm. We find that this is not the case in France as the variables do not have significant explanatory power.

We also find that firm size is negatively associated with analysts' forecast accuracy. For example, we report the coefficient of *Firm Size* as 0.079, statistically significant at 1 percent level, when the dependent variable is the *Accuracy* in the short-term forecasts. In line with prior literature, this finding suggests that large firms are generally more complex which reduces forecasting ability.

In general, in line with prior results we find some evidence to suggest that internal capital markets operations have significant impact on short-term earnings forecast accuracy. For example, when the dependent variable is *1-year Accuracy* we report *ICM Size* as 0.009, statistically significant at 10 percent level. This provides some evidence to suggest that internal capital markets aggravate firm complexity and, in turn, reduce forecast accuracy. However, we find that this variable is insignificant when the dependent variable is *2-year* or *LTG* forecast. This indicates that internal capital markets size has a greater impact on short-term rather than long-term forecast accuracy.

7.6.2. Bias

We find some evidence to suggest that analysts are less optimistic about firms' long-term performance when the firm operates large internal capital markets. For example, when the dependent variable is *Bias* in *LTG,* we report the coefficient of the variable *ICM Size* as 0.815, statistically significant at 10 percent level. This suggests that increasing internal capital market activity reduces the level of optimism in forecasts. It may be that analysts consider internal capital markets to be inefficient in general and, thus, higher internal capital market activity will further reduce the profitability of a firm by misallocating resources.

On the other hand, we find that there is significant evidence to suggest that firms in Germany operating smaller but more efficient internal capital markets have higher level of bias in short-term forecasts. For example, when the dependent variable is *2-year Bias*, we report the coefficient of *DE x ICM Size* as 0.009, statistically significant at 10 percent level. Similarly, we find that *DE x ICM Efficiency* appears as -0.032, statistically significant at 5 percent level. This suggests that analysts consider firms to be more profitable if they operate a limited and an efficient internal capital market in Germany.

Interestingly, we find that *FR x ICM Size* appears negative and significant in our analysis. We report the coefficient of this variable as -0.014, statistically significant at 5 percent level. This suggests that analysts are more favourable towards firms that operate internal capital markets to a greater extent than the UK.

Lastly, we find some evidence to suggest that firms' decision to raise finance externally increases the optimism in forecasts. For example, when the dependent variable is *2-year Bias*, we report the Δ *Debt* as -0.048, statistically significant at 5 percent level. This is in line with the findings of Bradshaw et al. (2006) suggesting that analysts are more optimistic about firms' performance that raise finance on external markets. Furthermore, we also find that change in debt level lowers the forecast accuracy.

7.6.3. Dispersion

We find some evidence to suggest that internal capital market activity has a significant impact on the level of dispersion in the short-term forecasts. When the dependent variable is the *Dispersion* in *2-year* forecasts, we report the coefficient of the variable *ICM Size* as 0.109, statistically significant at 5 percent level. This is in line with the prior findings that size of internal capital markets lowers the forecast accuracy and leads to an increase in the level of disagreement between analysts.

In comparison to the UK there is more dispersion in analysts' short-term forecasts when firms operate larger internal capital markets in France. For example, with the dependent variable is the *2-year Dispersion*, we find that *FR x ICM Size* appears as -0.137, statistically significant at 10 percent level. Additionally, we find that *FR x ICM Efficiency* appears positive and statistically significant. These findings shed light on some key differences in internal capital markets and forecast errors between the three countries in our study.

Furthermore, analysts appear to be more optimistic about future performance of the firm when the firm is large. We report the coefficient of *Firm Size* as -0.121, statistically significant at 1 percent level, when the dependent variable is *Bias* in short-term forecasts. This is in line with study of Plumlee (2003) who documents that analysts are more optimistic when task complexity is high.

Table 7.15

Analysts' Forecast Errors and ICM.

	Accuracy			Bias			Dispersion		
	1-year	*2-year*	*LTG*	*1-year*	*2-year*	*LTG*	*1-year*	*2-year*	*LTG*
ICM Size	0.009*	0.004	-0.186	-0.005	-0.001	0.815*	-0.170	0.109**	-0.124
	(0.065)	(0.207)	(0.620)	(0.362)	(0.787)	(0.090)	(0.294)	(0.042)	(0.687)
ICM Efficiency	0.001	0.000	-1.152	-0.002	-0.001	-1.700	0.006	0.002	-0.525
	(0.242)	(0.645)	(0.337)	(0.200)	(0.473)	(0.221)	(0.424)	(0.335)	(0.654)
Firm size	0.079***	0.074***	-3.456	-0.121***	-0.147***	7.742	-0.056	0.028	3.602*
	(0.002)	(0.000)	(0.266)	(0.000)	(0.000)	(0.131)	(0.758)	(0.773)	(0.097)
HI	-0.008**	-0.001	0.179	0.009**	0.001	0.136	-0.024	-0.023	-0.544**
	(0.049)	(0.370)	(0.131)	(0.032)	(0.443)	(0.509)	(0.417)	(0.131)	(0.016)
Δ Debt	-0.013	0.029*	4.870*	-0.016	-0.043**	-3.022	-0.026	-0.073	1.068
	(0.538)	(0.055)	(0.064)	(0.428)	(0.048)	(0.378)	(0.873)	(0.686)	(0.533)
Δ Equity	-0.000*	0.000	0.005	0.000	-0.000	0.003	-0.000	-0.000	-0.022***
	(0.097)	(0.629)	(0.508)	(0.695)	(0.141)	(0.842)	(0.224)	(0.462)	(0.000)
Capex	0.082	0.026	-2.992**	-0.135	-0.140**	6.866***	0.689	0.127	4.966*
	(0.365)	(0.578)	(0.034)	(0.239)	(0.040)	(0.011)	(0.257)	(0.843)	(0.080)
Sales Growth	-0.001	-0.002	0.515	-0.002	-0.004	2.842**	-0.023	-0.089	2.137
	(0.901)	(0.603)	(0.610)	(0.727)	(0.414)	(0.045)	(0.668)	(0.206)	(0.482)
Crisis	0.022***	0.001	0.594	0.002	0.032***	3.454***	0.086	0.052	1.536**
	(0.000)	(0.882)	(0.483)	(0.730)	(0.000)	(0.004)	(0.263)	(0.226)	(0.035)
Crisis x ICM Size	-0.001	-0.005	0.996*	-0.003	0.002	0.347	0.217	0.042	0.111
	(0.790)	(0.166)	(0.100)	(0.569)	(0.646)	(0.627)	(0.285)	(0.534)	(0.859)
Crisis x Efficiency	-0.002	-0.000	-1.553	0.002	0.001	-0.736	-0.009	-0.009*	1.734
	(0.125)	(0.591)	(0.495)	(0.110)	(0.410)	(0.776)	(0.344)	(0.083)	(0.252)
FR x ICM size	-0.010	0.003	-0.274	0.000	-0.014**	-0.079	0.099	-0.137*	0.192
	(0.216)	(0.517)	(0.671)	(0.978)	(0.021)	(0.913)	(0.273)	(0.077)	(0.662)
DE x ICM size	-0.019**	-0.007**	-0.396	0.013	0.009*	-0.186	0.676	-0.031	0.802
	(0.038)	(0.048)	(0.699)	(0.185)	(0.072)	(0.892)	(0.237)	(0.785)	(0.327)
FR x ICM	-0.011	0.010	4.080	0.021	0.024	1.804***	0.579	0.196*	0.859
efficiency	(0.547)	(0.470)	(0.372)	(0.478)	(0.247)	(0.001)	(0.129)	(0.078)	(0.670)
DE x ICM	-0.045**	-0.044***	-3.150	0.046	-0.032**	2.907	-1.753	-0.308	1.830
efficiency	(0.043)	(0.000)	(0.288)	(0.151)	(0.022)	(0.530)	(0.251)	(0.104)	(0.321)
Constant	-0.427***	-0.381***	3.578*	0.692***	0.832***	-6.507**	0.403	-0.042	-2.779*
	(0.005)	(0.000)	(0.078)	(0.000)	(0.000)	(0.052)	(0.706)	(0.943)	(0.080)

R-Sq.	0.018	0.025	0.005	0.006	0.009	0.008	0.026	0.003	0.008
Obs.	2,855	2,855	1,107	2,855	2,855	1,107	2,331	2,296	549

This table shows the estimation results from the regression analysis examining the relationship between internal capital markets and analysts' earnings forecast errors in the UK, France and Germany. The dependent variable in this analysis is accuracy, bias or dispersion. The analysts' forecast errors are between 2006 and 2011. Crisis takes a value of 1 if the reporting year is 2008, 2009 or 2010 and 0 otherwise. DE and FR take a value of 1 if the firms' home country is Germany or France and 0 otherwise. Internal capital market variables are measured between 2005 and 2010. All regressions are estimated with fixed effects. ***, ** and * represent 1%, 5% and 10% significant level.

7.7. Robustness Checks

In this section, we examine the robustness of the results reported earlier by using alternative methods to compute the key variables in our analysis. Firstly, we take the analysts' forecast errors at t+3 months after firms' fiscal year-end month instead of taking forecast errors at t+4 months. Secondly, we normalise the dependent variable by realised earnings, instead of using month end stock price. Third, we use alternative measures of size and efficiency of internal capital markets. We discuss our findings in the subsequent subsections.

7.7.1. Forecast Error at t+3 Months

In the analysis in prior sections, we followed Bradshaw et al. (2006) and computed analysts forecast errors at 4 months after the firms' fiscal year-end month. In this section, we compute analysts' earnings forecast errors after 3 months of fiscal year-end month. The three month time period between year-end month and earnings forecast issued by analysts is also used in the study by Rajan and Sarvaes (1997). Our objective is to select a forecast month in which we can be sure that analysts have access to financial statements of the firm and are able to incorporate the information on firms' internal capital market operation and efficiency into their forecasts.

We present the regression results in Table 7.16 for all three countries in our analysis. In general, we find that internal capital market variables have limited impact on forecast errors in all three countries. For example, although we find that *ICM Size* appears positive for *Accuracy 1-year* and *LTG*, which indicates that larger internal capital market operations reduce forecast accuracy, however, it does not have any significant explanatory power.

Similarly, we find that *ICM Efficiency* appears negative when the dependent variable is *Bias* in short-term forecasts. This suggests that analysts are more optimistic about the future performance of the firm that operates an efficient internal capital markets. However, this finding is also insignificant in our analysis. On the other hand, we find some evidence to suggest internal capital markets operation and efficiency is related to dispersion in long-term forecasts in France. For example, when the dependent variable is *Dispersion* in *LTG* forecasts, we find that *FR x ICM Size* and *FR x ICM Efficiency* appear negative and significant at 5 percent significance level.

Consistent with results reported in prior sections, we find that accuracy of forecasts is negatively related to the firm size. This finding is in line with the theory that large firms increase task complexity and reduce forecast accuracy. We find that analysts are more optimistic about firms that are large. In line with study by Plumlee (2003), this also suggests that analysts are more optimistic about firms that are more complex.

Furthermore, we find that raising finance on the external markets is generally related to higher optimism in forecasts, in line with the findings of Bradshaw et al. (2006). For example, when the dependent variable is Bias in short-term forecasts, we find the variable Δ *Debt* appears as -0.077, statistically significant at 1 percent level. This may suggest higher optimism is related with firms having good investment opportunities that decide to raise finance or it may indicate investment banking conflicts as documented in prior studies.

Table 7.16

Analysts' Forecast Errors at Month 3.

	Accuracy			Bias			Dispersion		
	1-year	*2-year*	*LTG*	*1-year*	*2-year*	*LTG*	*1-year*	*2-year*	*LTG*
ICM Size	0.003	-0.000	0.116	-0.000	0.002	-0.156	-0.009	-0.022	-0.088
	(0.617)	(0.970)	(0.785)	(0.979)	(0.625)	(0.780)	(0.806)	(0.191)	(0.774)
ICM Efficiency	0.001	0.000	-0.988	-0.002	-0.000	0.007	-0.001	-0.015	0.381
	(0.236)	(0.825)	(0.453)	(0.177)	(0.684)	(0.997)	(0.761)	(0.354)	(0.754)
Firm size	0.116*	0.028	11.117**	-0.226***	-0.152***	2.262***	0.206	0.277	1.569
	(0.075)	(0.228)	(0.036)	(0.001)	(0.000)	(0.002)	(0.247)	(0.101)	(0.555)
HI	-0.001	0.003	-0.026	0.008	-0.003	0.089	0.009	0.009	-0.023
	(0.698)	(0.169)	(0.589)	(0.127)	(0.897)	(0.752)	(0.329)	(0.312)	(0.832)
Δ Debt	-0.064**	0.026	0.045	-0.058*	-0.077***	4.157	0.044	0.019	0.829
	(0.028)	(0.309)	(0.985)	(0.068)	(0.011)	(0.152)	(0.584)	(0.688)	(0.565)
Δ Equity	-0.000**	0.000	-0.007	0.000	0.000	0.005	0.000	0.000	-0.002
	(0.025)	(0.590)	(0.119)	(0.706)	(0.924)	(0.353)	(0.111)	(0.555)	(0.715)
Capex	-0.405*	-0.001	-4.259***	-0.297	-0.277	2.925	0.268	0.132	-4.898
	(0.060)	(0.996)	(0.007)	(0.294)	(0.168)	(0.177)	(0.586)	(0.589)	(0.769)
Sales Growth	0.004	-0.005	6.509***	0.004	-0.002	2.643	-0.090	0.002	-2.597
	(0.658)	(0.460)	(0.000)	(0.667)	(0.734)	(0.446)	(0.236)	(0.941)	(0.273)
Crisis	0.040***	0.028***	-0.087	0.005	0.003	3.234***	-0.014	0.016	0.572
	(0.001)	(0.005)	(0.913)	(0.743)	(0.786)	(0.003)	(0.770)	(0.667)	(0.537)
Crisis x ICM Size	0.006	-0.002	0.343	-0.003	0.002	1.290*	-0.002	0.011	0.441
	(0.359)	(0.506)	(0.539)	(0.725)	(0.593)	(0.066)	(0.960)	(0.516)	(0.586)
Crisis x Efficiency	-0.001	0.000	2.478	0.002*	0.003	-1.791	-0.000	0.016	-3.484*
	(0.172)	(0.819)	(0.239)	(0.075)	(0.581)	(0.526)	(0.966)	(0.342)	(0.094)
FR x ICM size	0.009	-0.000	0.113	0.026	-0.004	0.468	0.005	0.004	-3.892***
	(0.640)	(0.968)	(0.876)	(0.201)	(0.951)	(0.601)	(0.918)	(0.810)	(0.000)
DE x ICM size	-0.006	-0.003	0.537	0.003	-0.002	-0.369	-0.037	0.032	-0.886
	(0.486)	(0.916)	(0.483)	(0.971)	(0.707)	(0.745)	(0.428)	(0.423)	(0.288)
FR x ICM	0.046	0.011	0.967	0.072	0.045	2.183***	0.001	0.094*	-12.781***
efficiency	(0.293)	(0.639)	(0.853)	(0.283)	(0.165)	(0.000)	(0.993)	(0.069)	(0.000)
DE x ICM	0.168	0.049**	6.307	0.153	0.007	1.964	0.238**	-0.153	9.895
efficiency	(0.390)	(0.025)	(0.867)	(0.444)	(0.772)	(0.622)	(0.031)	(0.251)	(0.273)
Constant	0.754*	0.216	8.688***	1.353***	0.904***	-16.174***	-1.086	-1.582	-9.757
	(0.054)	(0.102)	(0.014)	(0.001)	(0.000)	(0.001)	(0.298)	(0.115)	(0.607)

R-Sq.	0.007	0.012	0.007	0.001	0.002	0.010	0.000	0.003	0.042
Obs.	2,654	2,654	935	2,654	2,654	935	2,607	2,607	491

This table shows the estimation results from the regression analysis examining the relationship between internal capital markets and analysts' earnings forecast errors in the UK, France and Germany. The dependent variable in this analysis is accuracy, bias or dispersion calculated at t+3 months after the firms' fiscal year-end month. The analysts' forecast errors are between 2006 and 2011. Crisis takes a value of 1 if the reporting year is 2008, 2009 or 2010 and 0 otherwise. DE and FR take a value of 1 if the firms' home country is Germany or France and 0 otherwise. Internal capital market variables are measured between 2005 and 2010. All regressions are estimated with fixed effects. ***, ** and * represent 1%, 5% and 10% significant level.

7.7.2. Normalising Dependent Variables

In this section, we present the results from the analysis using dependent variables normalised by actual earnings instead of the month-end stock price and determine whether this changes our results significantly. In Section 7.2, the forecast *Accuracy* and *Bias* were normalised by *Stock Price* (Bradshaw et al. 2006) and the *Dispersion* in forecasts was normalised by *Mean Forecast* in that month. In this section, we normalise the *Accuracy* of the forecast and *Bias* in the forecast by the *Actual Earnings* (Hall and Tacon, 2010). Similarly, we normalise the *Dispersion* in forecasts by end of the month *Stock Price* (Barron and Stuerke, 1998).

The results from the regression analysis are reported in Table 7.17. In general, our findings again indicate that internal capital markets variable do not have a significant impact on forecast errors. Although we find that the variable *ICM Size* is positive when the dependent variable is *Accuracy* or *Dispersion* of the forecasts, these results are insignificant. Similarly, the variable *ICM Efficiency* is negative when the dependent variable is *Bias*, however, it is also insignificant at any level.

On the other hand, we do find some evidence to suggest analysts are more optimistic about future performance of the firm that operates an efficient internal capital market in Germany compared with the UK. Similarly, the variable *ICM Efficiency* in Germany is negatively related to Dispersion in forecasts, suggesting that there is significantly less disagreement about firms performance that operate efficient internal capital markets in Germany compared with the UK.

Table 7.17

Analysts' forecast errors – alternative method.

	Accuracy			Bias			Dispersion		
	1-year	*2-year*	*LTG*	*1-year*	*2-year*	*LTG*	*1-year*	*2-year*	*LTG*
ICM Size	-0.036	0.013	0.271	0.235	-0.007	0.418	0.009	-0.000	0.016
	(0.936)	(0.898)	(0.330)	(0.224)	(0.522)	(0.180)	(0.639)	(0.997)	(0.549)
ICM Efficiency	0.0415	0.005	0.310	-0.043	-0.002	-0.198	-0.000	0.000	-0.00
	(0.373)	(0.533)	(0.659)	(0.348)	(0.779)	(0.757)	(0.981)	(0.822)	(0.972)
Firm size	1.077	0.652*	1.287	-1.926*	-1.762***	-1.383	0.015	0.017	-0.556***
	(0.254)	(0.061)	(0.539)	(0.054)	(0.000)	(0.539)	(0.306)	(0.126)	(0.008)
HI	-0.451	-0.081	0.260	0.413	-0.016	0.381**	-0.001	-0.001	-0.005
	(0.322)	(0.284)	(0.169)	(0.370)	(0.793)	(0.029)	(0.221)	(0.317)	(0.505)
Δ Debt	-0.320	-0.094	1.429	0.851	0.190	-2.387	-0.007	-0.002	0.214**
	(0.842)	(0.855)	(0.374)	(0.603)	(0.723)	(0.183)	(0.517)	(0.818)	(0.048)
Δ Equity	-0.001	-0.004	0.061**	0.001	-0.000	0.062**	-0.000**	-0.000	-0.001*
	(0.505)	(0.439)	(0.042)	(0.589)	(0.862)	(0.038)	(0.048)	(0.175)	(0.091)
Capex	8.095	-0.822	-5.885	-8.946	-0.589	0.381	0.023	0.043	-1.697
	(0.272)	(0.478)	(0.181)	(0.234)	(0.610)	(0.925)	(0.385)	(0.245)	(0.240)
Sales Growth	0.590	0.117	2.340***	-0.579	-0.178	2.338**	-0.003	-0.002	-0.204*
	(0.359)	(0.509)	(0.001)	(0.371)	(0.360)	(0.040)	(0.246)	(0.302)	(0.072)
Crisis	-0.110	0.123	-0.253	0.853	0.452***	-0.121	0.012***	0.009***	0.332***
	(0.846)	(0.483)	(0.361)	(0.134)	(0.012)	(0.698)	(0.000)	(0.010)	(0.000)
Crisis x ICM Size	0.117	-0.181	0.624**	-0.195	-0.110	-0.277	-0.000	-0.001	0.011
	(0.549)	(0.126)	(0.015)	(0.376)	(0.444)	(0.418)	(0.900)	(0.750)	(0.819)
Crisis x Efficiency	-0.041	-0.003	-0.883	0.047	0.008	0.344	-0.001	-0.000	-0.086
	(0.395)	(0.845)	(0.613)	(0.327)	(0.659)	(0.834)	(0.453)	(0.879)	(0.521)
FR x ICM size	-0.046	0.061	-0.695*	-0.198*	0.065	0.341	-0.004**	-0.001	0.009
	(0.660)	(0.703)	(0.067)	(0.064)	(0.737)	(0.474)	(0.043)	(0.521)	(0.978)
DE x ICM size	-0.352	0.067	-0.523	-0.241	0.305	-0.797	0.003	-0.001	0.069
	(0.279)	(0.669)	(0.154)	(0.550)	(0.165)	(0.159)	(0.205)	(0.639)	(0.230)
FR x ICM	-0.728	0.205	-0.711	-0.522	0.129	7.636**	-0.002	0.002	0.587***
efficiency	(0.481)	(0.407)	(0.821)	(0.438)	(0.669)	(0.031)	(0.831)	(0.684)	(0.000)
DE x ICM	0.649	0.405	-2.533	-1.132	-0.943***	4.337	-0.029***	-0.009**	0.699
efficiency	(0.359)	(0.115)	(0.334)	(0.236)	(0.005)	(0.236)	(0.000)	(0.021)	(0.743)
Constant	-5.531	-2.951	-5.791	10.935*	9.913***	8.593	-0.083	-0.095	4.069***
	(0.308)	(0.151)	(0.675)	(0.058)	(0.000)	(0.562)	(0.346)	(0.156)	(0.006)

R-Sq.	0.000	0.008	0.004	0.001	0.004	0.002	0.002	0.002	0.025
Obs.	2,855	2,855	1,107	2,855	2,855	1,107	2,378	2,378	547

This table shows the estimation results from the regression analysis examining the relationship between internal capital markets and analysts' earnings forecast errors in the UK, France and Germany. The dependent variable in this analysis is accuracy, bias or dispersion. Accuracy and Bias are normalised by actual earnings and Dispersion is normalised by end of month stock price. The analysts' forecast errors are between 2006 and 2011. Crisis takes a value of 1 if the reporting year is 2008, 2009 or 2010 and 0 otherwise. DE and FR take a value of 1 if the firms' home country is Germany or France and 0 otherwise. Internal capital market variables are measured between 2005 and 2010. All regressions are estimated with fixed effects. ***, ** and * represent 1%, 5% and 10% significant level.

7.7.3. ICM Operation and Efficiency

As a final step, we use an alternative measure of internal capital market operations and efficiency in our analysis. In the analysis above, the internal capital market variables are computed using average industry values. In this section, we use internal capital market variables that are computed using median values instead of averages. The findings are reported in Table 7.18.

In line with prior findings, the results mainly suggest that internal capital market efficiency is negatively related to the size of the forecast errors. For example, we report the coefficient of the variable *ICM Efficiency* as -1.594, statistically significant at 10 percent level, when the dependent variable is the *Accuracy* of long-term growth forecasts. This suggests that forecasting accuracy improves when firms allocate resources efficiently through internal capital markets.

The results also indicate that analysts tend to be less optimistic about the long-term performance of firms that operate large internal capital markets. On the other hand, more efficient internal capital markets are associated with higher optimism in the long-term forecasts. However, we find that this is not the case with short-term forecasts as internal capital markets variables appear as insignificant.

We also find that firm size is negatively related to forecast accuracy and positively related to optimism in analysts' forecasts. These findings again suggest that larger firms are more complex and reduce forecast accuracy. Analysts tend to be more optimistic about the future performance of large firms. Finally, as discussed earlier, our findings indicate that raising finance on external markets is generally associated with higher optimism in forecasts but lower accuracy.

Table 7.18

Analysts' Forecast Errors and ICM.

	Accuracy			Bias			Dispersion		
	1-year	*2-year*	*LTG*	*1-year*	*2-year*	*LTG*	*1-year*	*2-year*	*LTG*
ICM Size	0.001	-0.004	-0.377	0.001	0.003	1.045**	0.009	-0.002	2.455
	(0.881)	(0.400)	(0.180)	(0.929)	(0.554)	(0.022)	(0.255)	(0.876)	(0.145)
ICM Efficiency	-0.022	-0.011	-1.594*	0.019	0.004	-3.111**	-0.075	-0.004	-8.419*
	(0.218)	(0.106)	(0.094)	(0.315)	(0.618)	(0.030)	(0.546)	(0.956)	(0.096)
Firm size	0.077***	0.076***	-3.279	-0.120***	-0.149***	7.599	-0.010	0.013	4.506**
	(0.003)	(0.000)	(0.286)	(0.000)	(0.000)	(0.146)	(0.951)	(0.893)	(0.042)
HI	-0.008*	-0.001	-0.019	0.009*	0.001	-0.155	-0.025	-0.076	-2.097
	(0.068)	(0.286)	(0.896)	(0.055)	(0.464)	(0.522)	(0.408)	(0.358)	(0.047)
Δ Debt	-0.016	0.032**	5.061*	-0.013	-0.048**	-3.309	0.038	-0.061	5.021*
	(0.428)	(0.036)	(0.054)	(0.502)	(0.048)	(0.388)	(0.833)	(0.737)	(0.092)
Δ Equity	-0.000*	0.000	0.005	0.000	-0.000	0.004	-0.001	-0.000	-0.018***
	(0.080)	(0.545)	(0.483)	(0.728)	(0.132)	(0.795)	(0.242)	(0.357)	(0.001)
Capex	0.090	0.031	-2.722*	-0.139	-0.134**	6.579***	0.745	0.222	5.583**
	(0.323)	(0.497)	(0.065)	(0.236)	(0.039)	(0.011)	(0.202)	(0.730)	(0.050)
Sales Growth	-0.002	-0.001	0.529	-0.002	-0.004	3.063**	0.075	-0.087	3.058
	(0.838)	(0.629)	(0.599)	(0.812)	(0.502)	(0.034)	(0.493)	(0.207)	(0.310)
Crisis	0.021***	-0.001	0.695	0.003	0.031***	3.271***	0.119	0.025	1.345**
	(0.000)	(0.892)	(0.397)	(0.631)	(0.000)	(0.004)	(0.131)	(0.626)	(0.051)
Crisis x ICM Size	0.004	-0.002*	0.856*	-0.007	0.001	0.429	0.078	0.098	0.198
	(0.541)	(0.069)	(0.056)	(0.413)	(0.338)	(0.521)	(0.262)	(0.224)	(0.614)
Crisis x Efficiency	-0.004	-0.000	-2.947	0.001	0.000	-1.145	-0.003	-0.005	1.472
	(0.245)	(0.967)	(0.182)	(0.229)	(0.467)	(0.635)	(0.242)	(0.187)	(0.381)
FR x ICM size	-0.002	0.001	-7.047	0.008	-0.016**	-2.447	-0.069	-0.037	2.206
	(0.799)	(0.848)	(0.174)	(0.260)	(0.021)	(0.676)	(0.138)	(0.246)	(0.485)
DE x ICM size	0.003	0.007	0.176	0.000	-0.011	1.229	0.034	-0.051	1.723
	(0.811)	(0.421)	(0.868)	(0.981)	(0.416)	(0.626)	(0.916)	(0.525)	(0.303)
FR x ICM	0.057	0.019	-8.812	0.132*	0.088	6.423	2.862*	0.766	5.605*
efficiency	(0.534)	(0.515)	(0.217)	(0.059)	(0.168)	(0.383)	(0.098)	(0.351)	(0.085)
DE x ICM	0.260	-0.173	1.916	-0.292	-0.025	5.268	-3.157	0.036	-5.685
efficiency	(0.144)	(0.266)	(0.500)	(0.154)	(0.955)	(0.512)	(0.296)	(0.969)	(0.891)
Constant	-0.418***	-0.386***	3.453*	0.687***	0.835***	-6.377*	0.165	0.085	-3.349**
	(0.006)	(0.001)	(0.086)	(0.000)	(0.000)	(0.062)	(0.870)	(0.884)	(0.039)

R-Sq.	0.017	0.025	0.004	0.006	0.009	0.008	0.040	0.001	0.007
Obs.	2,855	2,855	1,107	2,855	2,855	1,107	2,331	2,359	549

The dependent variable in this analysis is accuracy, bias or dispersion, as described in Section 7.2. The analysts' forecast errors are between 2006 and 2011. Internal capital market variables are measured between 2005 and 2010. The internal capital markets variables are constructed using median industry values instead of average industry values. The analysts' forecast errors are between 2006 and 2011. Crisis takes a value of 1 if the reporting year is 2008, 2009 or 2010 and 0 otherwise. DE and FR take a value of 1 if the firms' home country is Germany or France and 0 otherwise. Internal capital market variables are measured between 2005 and 2010. All regressions are estimated with fixed effects. ***, ** and * represent 1%, 5% and 10% significant level.

7.8. Summary

In this chapter, we investigate the link between analysts' earnings forecast errors and internal capital markets. In particular, we focus on the accuracy, bias and dispersion in analysts' short-term and long-term earnings forecasts, and the operation and efficiency of internal capital markets in UK, France and Germany. We measure the operation and efficiency of internal capital markets within diversified firms between 2005 and 2010. The analysts forecast characteristics are obtained at *t+1*, i.e. between 2006 and 2011 for these firms.

It is now well documented that firm complexity can reduce forecast accuracy (Duru and Reeb, 2002; Plumlee, 2003). Our objective is to determine whether operation and efficiency of internal capital markets aggravate firm complexity and, thus, affect earnings forecast errors. Previous research has mainly looked at external financing measures and forecast accuracy (e.g. Bradshaw et al., 2006); however, the link between operations and efficiency of internal capital markets and earnings forecast errors remains unexplored.

In general, we find limited evidence of the relationship between internal capital markets and forecast errors. Overall, we find that analysts are generally optimistic about firms' future performance. This is consistent for both short- and long-term earnings forecast across the three countries in our sample. We find that there is only some evidence which suggests that operations and efficiency of internal capital markets has an impact on the accuracy of short-term earnings forecasts in the UK. This suggests that internal capital markets aggravate firm complexity to certain extent and reduce forecast accuracy. In addition, the efficiency of internal capital markets appears to be positively related to forecast bias only in Germany, indicating that analysts consider efficient firms to be more profitable in the future.

Furthermore, our results suggest that firms which operate larger internal capital markets have higher level of dispersion in long-term earnings growth forecasts in the UK. This finding is more pronounced in highly diversified firms. This suggests that internal capital markets aggravate firm complexity and reduce forecast accuracy which, in turn, leads to higher level of disagreement amongst analysts. However, we do not find any evidence to suggest that this is the case with short-term earnings forecast in all three countries.

In Chapter 8, we discuss the key findings of the study on financial systems, internal capital markets and the financial crisis of 2008. We also discuss our main findings from the analysis on internal capital markets and analysts' earnings forecast errors. We also discuss some of the limitations of the studies and future research that can add to our understanding of internal capital markets and analysts' earnings forecasts.

Chapter 8 – Conclusion And Discussion

8.1. Introduction

The purpose of this thesis is to examine the operations and efficiency of internal capital markets in two opposing financial systems, namely, the market-based and bank-based financial systems, and it's with analysts' earnings forecast errors.

This study contains a number of important and original aspects, and it contributes to the existing literature in a number of ways. The main objectives of the research are: 1) determine whether internal capital markets are active and efficient, 2) document the similarities and differences in the operations and efficiency of internal capital markets in market- and bank-based systems, 3) examine the impact of the financial crisis of 2008 on operation and efficiency of internal capital markets in these two financial systems, 4) investigate the link between internal capital markets and analysts' forecast errors, and determine whether the extent of internal capital market operations have an impact on analysts' earnings forecast accuracy, bias and dispersion, and 5) whether the efficiency of internal capital markets have an effect on forecast accuracy, bias and dispersion.

In this chapter, we discuss our results from the empirical analysis on financial systems, internal capital markets and the financial crisis of 2008 in Section 8.2. In Section 8.3, we discuss our results from the empirical analysis on internal capital markets and analysts' earnings forecast errors. Next, in Section 8.4 we discuss the contribution to existing literature and policy implications are discussed in Section 8.5. Lastly, Sections 8.6 and 8.7 presents the discussion on limitations and suggestions for future research.

8.2. Financial Systems, Internal Capital Markets and the Financial Crisis

The main purpose of internal capital markets is to facilitate the allocation of resources within diversified firms. In general, prior empirical studies have shown that internal capital markets are active in the US (Shin and Stulz, 1998; Hovakimian, 2011). However, internal capital markets appear to allocate more resources to divisions with poor investment opportunities and fewer resources to divisions with good investment opportunities (Rajan et al., 2000; Scharfstein and Stein, 2000). A number of studies have suggested that, in the event of external resources becoming more expensive or unavailable such as during a recession, managers significantly improve the efficiency of internal capital markets (Kuppuswamy and Villalonga, 2010).

We find evidence to suggest that diversified firms operate internal capital markets, i.e. internal capital markets are active. For example, in our analysis we find that a segment of a diversified firm is significantly dependent on internal resources available for reallocation for its investments. However, we report limited internal capital markets operations in Germany, whereas, internal capital markets appear to play a more active in France compared to the UK. Internal capital markets appear to be more successful at reducing segment's dependence on its own cash flow for investment in France and enable firms to shield segment investments from adverse cash flow shocks. In contrast, internal capital markets appear to be less active in Germany. This suggests that segments are more dependent on their own cash flow for investments and internal capital markets play a limited role in shielding segment investment from adverse shocks to their own cash flow.

Furthermore, we find that internal capital markets are generally inefficient at allocating resources. Thus, resources appear to flow from divisions with good investment opportunities and towards divisions with poor investment opportunities. On the one hand, the literature suggests that internal capital markets can add value by enabling diversified firms to finance good investment opportunities of a segment by using the cash flow of other segments, and hence, bypassing external markets. On the other hand, internal capital markets may destroy value if resources are misallocated to finance lesser profitable investments of the firm. Our results are mainly in line with prior literature and suggest that managers generally misallocate resources.

Our analysis also indicates that the recent financial crisis of 2008 has a varied impact on the operation and efficiency of internal capital markets in bank- and market-based systems. In general, segment investments significantly decline during the financial crisis of 2008 in all three countries. This is in line with declining sales and investment opportunities across industries during this period (Campello et al., 2010; Kahle and Stulz, 2013). In line with the findings of Hovakimian (2011), we find that internal capital markets operations significantly decreased during the crisis in the UK. Firms make fewer cross-subsidisations of resources which may be due to declining firm-wide cash flow and investment opportunities. In contrast, internal capital markets operations increased during the crisis in France, while there is an insignificant change in Germany. Segments of diversified firms in France relied more on internal capital markets during difficult economic conditions. Firms in France may have used internal capital markets to support weaker segments by transferring more resources from cash-rich segments to cash-constrained segments.

Additionally, our results indicate that the efficiency of internal capital markets increases during the crisis only in market-based systems. Although, internal capital markets are still inefficient during the crisis period, they become significantly less inefficient compared with the non-recession period in the UK. However, this does not appear to be the case in bank-based systems as we report a significant decline in efficiency during the crisis period in France and insignificant change in Germany. This suggests that larger amount of capital resources are directed towards lesser profitable segments of the firm via internal capital markets during the crisis in France. This is in line with the theory that firms used internal capital markets to support segments in financial distress and not to finance investment projects of more profitable segments.

Also, firms in bank-based systems have close relationship with investors compared with arm's-length relationship between firms and investors in market-based systems. It is likely that firms in market-based systems face more stringent environment during the crisis which leads to greater increase in efficiency. For example, it has been well documented that banks can go out of their way to help distressed clients and maintain their relationship, even when it may appear to be a lesser profitable decision for the bank (Hoshi et al. 1991). Additionally, the government intervention during the crisis in France forced banks to increase lending to domestic firms (Hardie and Howarth, 2009). In such a situation, firms are less likely to experience stringent financial environment in bank-based systems compared with firms in market-based system. Thus, managers appear to be under less pressure to significantly improve their investment policies in France and Germany.

8.3. Analysts' Earnings Forecast Errors and Internal Capital Markets

Analysts provide detailed company analyses to numerous market participants via research reports and, within these reports, analysts provide key earnings forecasts, for example, the 1-year and 2-year earnings as well as long-term earnings growth forecasts. Prior literature has documented that this information can enable investors to make profitable investment decisions (e.g. Hall and Tacon, 2010) and, thus, the quality of these forecasts have received considerable attention in the academic literature (Ramnath et al., 2008). Prior empirical studies have shown that complexity of the firm increases with diversification and, which in turn, reduces analysts' ability to make accurate forecasts (Duru and Reeb, 2002). Our analysis focuses on three forecast characteristics, namely, the accuracy, bias, and dispersion. We determine whether operation and efficiency of internal capital markets increases firm complexity and effects analysts' earnings forecast errors.

In this study, we find some evidence to suggest that internal capital markets operations increase firm complexity and make it more difficult for analysts to make accurate forecasts. For example, we find that the accuracy of short-term forecasts decreases as the size of internal capital markets increases in the UK. However, this does not appear to be the case in France or Germany. This suggests that internal capital markets increase the uncertainty about firms' financing and investment decisions, which in turn, may aggravate uncertainties about its future earnings and profitability in some countries and not in others.

Furthermore, our finding indicate that internal capital markets operations appear to be negatively associated with bias in short-term forecasts. This suggests that analysts are more optimistic about performance of the firm that operates larger internal capital market. This is in line with prior studies suggesting that analysts are more optimistic when the complexity of the task increases (Plumlee, 2003).

Additionally, there is some evidence to suggest that dispersion in long-term forecasts is positively related to internal capital markets operations. For example, firms that tend to operate larger internal capital markets have higher level of disagreement amongst analysts about its long term performance in the UK. This suggests internal capital markets increase the complexity of the firm and the uncertainty about its future cash flow which then leads to higher variation in earnings forecasts.

Our analysis reveals that efficiency of internal capital markets does not have a significant impact on analysts' earnings forecast accuracy in the UK, as we expected in

Chapter 4. It appears that size of the internal capital market is a more important determinant of accuracy than its efficiency. These findings are robust when we perform a number of tests with alternative variables. In the case of Germany, we find some evidence that suggests that efficiency of internal capital markets is positively related to short-term forecast accuracy, i.e. firms that operate efficient internal capital markets have lower forecast errors. This is in line with our hypothesis and suggests that efficiency of internal capital markets efficiency provides a signal about the internal workings of the firm,

Furthermore, analysts are generally optimistic about firms' future performance and bias in short-term forecasts is higher for firms that operate more efficient internal capital markets in Germany. However, there is no evidence to suggest this is also the case in UK or France. This suggests that analysts anticipate more efficient capital allocation will generate higher cash flow and earnings in the future. Lastly, we do not find any evidence to suggest efficiency of internal capital markets is related to the level of dispersion in analysts' forecasts.

8.4. Contribution to Literature

The findings reported in this thesis are interesting and insightful, and contribute to literature in many ways. In this section, we discuss the implication of our results on the literature on internal capital markets, financial systems and analysts' earnings forecasts.

8.4.1. Financial Systems and ICM Literature

Prior literature on internal capital markets generally finds that they are active and operate inefficiently (e.g. Maksimovic and Phillips, 2007). Our findings on the differences in the operations and efficiency of internal capital markets in two distinct financial systems provide further evidence not only between firms but also on how multi-segment firms operate in different countries.

In general, diversified firms appear to use internal capital markets to finance projects of a segment using cash flow of other segments within the firm. However, we find that extent of internal capital markets activity differs significantly between countries. For example, they tend to play a more subdued role in Germany, whereas a more significant role in France compared with UK.

Furthermore, a number of studies have documented that internal capital markets generally tend to operate inefficiently (Rajan et al., 2000; Scharfstein and Stein, 2000). We find that internal capital market efficiency differs significantly across countries. Firms in bank-based financial systems tend to operate more efficient internal capital markets compared with firms based in market-based financial systems.

Additionally, the impact of the financial crisis on the operation and efficiency of internal capital markets differs significantly across countries. For example, we find that the efficiency of internal capital markets significantly improves during the crisis only in market-based systems. In contrast, efficiency of internal capital markets does not improve during the crisis in Germany but declines in France.

Our findings suggest that the financial system of the country in which the firms is domiciled has a significant role in determining the operation and efficiency of internal capital markets. For example, there is significant evidence to suggest that supervisory role of banks and their active involvement in firms' investment project selection has a significant and positive impact on efficiency of internal capital markets in bank-based systems.

Furthermore, firms in bank-based systems do not appear to experience same level of pressure as firms in market-based systems to improve their investment policies during the financial crisis of 2008, as the prior literature appears to suggest. We only find significant and positive change in efficiency in the UK. This suggests that firms in bank-based systems do not experience the same level of stringent environment as firms in market-based systems. Also, relationships-based financing in bank-based systems appear to be better able to reduce the impact of adverse external capital shocks on firms investments than arm's-length financing in market-based systems.

8.4.2. Analysts' Forecast and ICM Literature

A number of studies have documented that firm complexity reduces analysts' earnings forecast accuracy. Furthermore, analysts tend to be more optimistic when task complexity is high. For example, diversified firms that operate in multiple industries tend to have lower accuracy and higher optimism (Duru and Reeb, 2002). However, there remains a gap in the literature on firm factors that increase their complexity.

We contribute to the literature by examining the relationship between internal capital markets as a factor that may increase firm complexity, and hence, effect the analysts' earnings forecast errors. Furthermore, prior empirical studies have mainly looked at the impact of equity and debt issue on analysts' earnings forecasts (for example see, Bradshaw et al., 2006), and to our knowledge, there are no studies which have examined the analysts' forecast accuracy and internal investment policies of diversified firms.

We find some evidence to suggest internal capital markets operations aggravates firm complexity and affects analysts' short-term earnings forecast accuracy in the UK.

Furthermore, we find some evidence to suggest the extent of internal capital market activity is positively related to dispersion in long-term earnings growth forecasts. These findings are more pronounced in the UK than in France or Germany.

Additionally, there is some evidence to suggest that efficiency of internal capital market is positively related to the level of optimism in short-term forecasts in Germany. This suggests that analysts tend to be more optimistic about future performance of the firm that operates efficient internal capital markets. Our analysis shows important cross-country differences in the impact of internal capital markets operation and efficiency on analysts' forecast errors.

8.5. Practical Implications

Our research sheds light on some of the important factors that may affect the activity and efficiency of internal capital markets. The findings may be useful for, but not limited to, investors, analysts and other market participants using analysts' earnings forecasts to form trading/investment decisions or to understand the financing and investment decisions within diversified firms.

8.5.1. Investors

Our research findings reveal that, in line with prior studies, internal capital markets are active and inefficient. Results are consistent across the three countries in our study and suggest that fewer resources are allocated towards divisions that appear to have good investment opportunities. These findings imply that there are potential opportunities available to investors that, if utilised, may enhance the value of the firm. For example, it has now been well-documented that efficient internal capital markets are related to the value of the firm (for example, Rajan et al., 2000; Kuppuswamy and Villalonga, 2010).

Furthermore, literature on efficiency of internal capital markets pays considerable attention to good corporate governance and alignment of interests. Thus, investors should consider (i) placing more emphasis on obtaining information on investment opportunities facing the firm that may enable them to differentiate between profitable from non-profitable projects without completely relying on analysis from management, (ii) look at placing independent body within the firm that is tasked with analysing and monitoring investment projects and reporting back to shareholders, and (iii) better mechanisms that align interests of managers with the interests of shareholders.

Additionally, our analysis reveals analysts' earnings forecasts, which may be used by investors to make investment or trading decisions, are affected by internal capital markets operations and efficiency. For example, the analysis reveals two key results. Firstly, analysts are systematically optimistic about the future performance of the firm that operates more efficient internal capital market. Secondly, the accuracy of the forecast is negatively affected by the size of firms' internal capital market. Investors should consider activity and efficiency of internal capital markets as additional variables that may impact the quality of forecasts.

Finally, our results provide support for the argument that internal capital markets help firms to shield good investments in the event of adverse cash flow shocks by cross-subsidising resources. This finding is in line with the findings reported by Hovakimian (2011) and Kuppuswamy and Villalonga (2010). Segments appear to cut-back on investment during the financial crisis to a lesser extent compared with focused firms operating in the same industry. Investors should take into account this important benefit of firms' internal capital market when considering investment in diversified or focused firm.

8.5.2. Financial Analysts

Internal capital markets play a key role in financing investment projects of segments within diversified firms. Our findings indicate that the presence of internal capital markets can increase the difficulty of forecasting future performance of the firm. This is because the cash flow generated by the firm in the future will depend on the type of investment projects being financed. On the one hand, efficient internal capital markets may enhance firm value by financing good investment projects. On the other hand, inefficient internal capital markets may destroy value if resources are misallocated.

In the main, the findings suggest that analysts should lay more emphasis on inter-segmental capital allocation of resources when producing their earnings forecasts. Furthermore, our analysis shows forecasts appear to be positively biased when firms operate an efficient internal capital market. Analysts should do more, given their close engagement with firms' management, to uncover the potential causes or factors that lead to an efficient or inefficient internal capital market within the firm. For example, analysts should attempt to uncover any signs of internal disputes, power struggles or CEO displaying favouritism and report back to firms' shareholders and potential investors.

Additionally, our research shows that financial structure of the country plays a key role in determining the activity and efficiency of internal capital markets. In line with prior studies such as Holmstorm and Tirole (1997) and Chakraborty and Ray (2006) our findings suggest monitoring and active involvement in firms' decision making process improves capital allocation process within firms. Analysts should take into account the financial structure of the country in which the segment or firm is operating when determining the operations and efficiency of internal capital markets.

8.5.3. Regulators

Our study suggests that policymakers in countries such as emerging markets where the trend may be towards developing a market-based system should consider this key advantage of bank finance over market finance. Literature on the role of markets in accelerating the growth of industries is sparse; however, banks role as financial intermediaries could itself be a source of value. The effect of good governance can lead to good corporate investments which, in turn, can support job creation and economic growth.

Furthermore, our research, in line with prior studies, indicates that internal resources are generally misallocated within diversified firms and directed towards divisions that appear to have weak investment opportunities. Although, these decisions are made within the firm and do not need to be disclosed, regulators should do more to reduce information asymmetry between firm and investors.

For example, regulators may be able to invite management to disclose some information (voluntarily or compulsory) on firms' investment opportunities in their annual reports which, in turn, can enable investors and analysts to better understand the decision making process within the firm and efficiency of internal capital markets. This can lead to reduced information asymmetry, better allocation of resources within the financial system and puts managers under more pressure to make better investment decisions.

Also, it has been documented that analysts' earnings forecasts errors are not only of interest to investors but also regulators as systematic errors can distort the capital allocation process within capital markets (Hilary and Hsu, 2013). Thus, our research puts forward additional variables that may help to explain the errors observed in forecast errors. For example our analysis indicates that forecast accuracy is significantly reduced when firms are operating larger internal capital markets. Furthermore, our results show that dispersion in earnings forecast is positively related to size of firms' internal capital market. As discussed above, unlike debt and equity finance, internal financing decisions are not required to be disclosed to external market participants that, in turn, can increase the complexity of the task of forecasting future profitability of the firm.

8.6. Limitations

In this study, we are not able to compute investment opportunities at segment level. Instead, we take the median industry value as a proxy for segment investment opportunities. However, it may be that the segment is significantly larger (or smaller) than average or median single segment firm in the industry. Thus, it may not be the best proxy for segment investment opportunities. We compute Tobin's-Q as a proxy for investment opportunities, which may not be the best proxy for segment opportunities. Although, we do make use of return on segment assets as an alternative, this is a backward-looking measure compared with Tobin's-Q is a forward-looking measure.

In our analysis we control for a number of factors while attempting to determine the effect of specific variables. However, due to data availability our list of control variables is not comprehensive. For example, stock options and equity holdings may also influence management to make more efficient capital allocations. As stock options are usually linked to the performance of the firm, and internal capital markets may be more efficient in their presence. We are not able to obtain data on compensation structure of executives of firms in our sample in three European countries. Additionally, this research mainly focuses on diversified firms and excludes single segment firms from the analysis. The main motivation behind our decision to exclude focused firms is that our objectives revolve around the operations and efficiency of internal capital markets within diversified firms.

The adoption of the IFRS accounting standards in 2005 required publicly listed companies to disclose information to the same set of rules and promotes the disclosure of more segment level information. However, the data we obtain on segments of diversified firms is consolidated, and thus, it may make the cross-country comparison more difficult. For our analysis, we exclude firms that have missing segment level data and assume the missing data is random. For example, it is not the case that smaller diversified firms have more missing data than larger diversified firms, as if that was the case, the latter will be overrepresented in our analysis.

The time period we examine is six years in which contain the recent financial crisis of 2008. It may be argued that the time period is not extensive enough to determine the prior and during crisis characteristics of internal capital markets and analysts' earnings forecasts. However, due to the major changes in accounting regulation in Europe in 2005, data prior to the year 2005 is patchy and incomplete. We use data from subsequent years as we are sure all firms are preparing financial statement using the same set of rules.

Lastly, this research does not examine whether analysts' employer, experience and education have an impact. Due to data limitations, we do not have the data at individual analyst level but only the aggregate data. For example, although we have data on number of analysts following a firm, but we are not able to determine whether those analysts belong to large organisations or whether they are so called star-analysts. We have the aggregate mean (median) forecast but not at analyst level information.

8.7. Future Research

This study has mainly examined the operations and efficiency of internal capital markets and analysts' earnings forecasts in three European countries before and during the financial crisis. Further research can develop on this work in a number of ways.

Firstly, it is well documented that internal capital markets can affect the value of a firm by allocating capital resources efficiently or inefficiently. Additionally, a firm with efficient internal capital market may also be able to raise finance for its investment projects at a lower cost than firms that are considered as inefficient. Prior literature is silent on whether efficient firms have a lower cost of capital than those which are inefficient, and it is here that future research can contribute to the literature by examining the relationship between firms' cost of capital and efficiency of internal capital markets. As the findings from this study suggest that country characteristics as well as firm characteristics can have an effect on efficiency of internal capital markets, thus, the objective should be to provide cross-country evidence on the cost of capital and internal capital markets relationship.

Secondly, behavioural finance, being the study of the influence of psychology on the behaviour of financial practitioners and the subsequent effect on markets, can help to explain why and how internal capital markets might be inefficient. Future research can investigate whether firms which display inefficient investment behaviour have an overconfident CEO. For example, a CEO who believes highly in his or her own ability and pays less attention to private/public signals when allocating capital resources is more likely to misallocate resources. The study should aim to provide another explanation to why internal resources may not be allocated efficiently in some firms while others may have well-functioning internal capital market.

Thirdly, a key distinction between single segment firms and multi-segment firms is the presence of internal capital markets in the latter. Prior literature documents that efficiency of internal capital markets is negatively related to the diversity of the firm. For example, firms misallocate resources when they tend to operate multiple segments in unrelated industries. One of the ways a firm may become more focused (diversified) is through a divesture (M&A). Future research can look to determine whether internal capital markets become more (less) efficient when a diversified firm engages in a divesture of a segment (addition of a segment through M&A).

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