



Why UK companies hedge interest rate risk

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Abstract

Purpose – The purpose of this paper is to examine the interest rate risk management (IRRM) practices of UK companies. In particular, the study examines five theories that have been advanced in the literature to explain why companies hedge: tax and regulatory arbitrage; under-investment, volatility of earnings and future planning; financial distress; managerial self-interest; and economies of scale.

Design/methodology/approach – The paper uses a questionnaire survey to examine the importance of hedging theories and to look at the detailed risk management practices of companies.

Findings – The research findings confirm that all five theories of financial risk management have some support in practice. However, while the responses to some questions supported the theories, other information elicited from the questionnaires did not. This finding demonstrates that studies which employ large disaggregated datasets that result in generalised conclusions often miss the dynamic nature of corporate affairs and that, as such, more qualitative research is needed in this area.

Originality/value – The use of a questionnaire survey facilitates an investigation of the IRRM practices of companies on an individual basis rather than the aggregated analysis afforded by most quantitative studies in finance. In addition, the qualitative approach adopted here permits an examination of many factors that relate to risk management practices, rather than just a limited number of financial ratios or factors that are typically used in studies of large datasets.

Keywords Interest rates, Hedging, Risk management, United Kingdom

Paper type Research paper

Introduction

Interest rate risk (IRR) represents one of the key forms of financial risk that companies encounter. In recent years, the management of IRR has gained prominence in the corporate sector of UK firms for several primary reasons. First, interest rate volatility in the UK has increased considerably in recent years. Rates in the UK, over the last few decades, have fluctuated from as high as 15 per cent to as low as 4 per cent (Arnold, 2005). Second, there has been a dramatic increase in the use of corporate debt in UK companies with firms financing more of their funding requirements through shorter-term borrowings rather than equity. Moreover, certain industries have witnessed a large increase in the number of highly leveraged transactions such as management buy-outs and take-overs (Arnold, 2005). Third, financial institutions now often use interest-rate based covenants in their funding arrangements with corporates, making the effects of fluctuations in interest rates a pressing issue for firms (Ross, 2002; Douche, 2003). Finally, the emphasis on financial risk in recent corporate

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governance codes such as the Cadbury Report (1992) and the Turnbull Report (ICAEW, 1999), has increased the transparency of corporate risk and risk management practices to the external market which has, in turn, necessitated a more professional approach within companies. However, in corporate financial risk management, much of the academic attention has been drawn to the management of foreign exchange rate risk, with a limited focus on that of IRR, despite its prominence in the practitioner literature (Bartram, 2002; Ross, 2002; Douche, 2003).

Despite this recent interest in risk management, the early finance literature argued that companies did not need to manage their risks or hedge their exposures. For example, Modigliani and Miller (1958) suggested that investors could replicate whatever risk management strategy a company might decide to pursue. Therefore, if a company was exposed to interest rate or exchange rate risk, this exposure did not need to be hedged by the company since investors could hedge it for themselves. However, risk management is widely used by finance directors, corporate treasurers and portfolio managers to reduce the volatility of their firm's profit. One reason for employing such a strategy is that the time horizons of these individuals are shorter than the time frame suggested by Modigliani and Miller. For example, Holland (1993) argues that, over the long-term, hedging may not be necessary if the expected value of the gains and losses over a long time period average out to zero. However, if the timing of a sizeable foreign currency receivable coincides with a large adverse change in the exchange rate, there would be little consolation in knowing that such a loss would correct itself in the long run. Indeed, Giuliani (2003) reports from a PWC survey that:

...high impact, low probability events do happen. And when they have the power to sink entire organizations, ignoring them is not an option (p.38).

Further, Titman (2002) argues that Modigliani and Miller's assumptions need to be re-examined. For example, Titman notes that practitioners often talk about "windows of opportunity" and "market conditions" which indicates that markets are not efficient and that opportunities arise that can give advantages. He also comments on how companies borrow shorter (longer) when the term structure is steep (flat) and that they time the term structure of interest rates and reduce their cost of capital by timing the debt markets.

A number of reasons for the use of derivatives have been suggested in the literature. In particular, the literature argues that companies may use derivatives to lower the likelihood of financial distress, minimise the volatility in cashflows and avoid underinvestment, protect managerial self-interest and lower tax payments. The objective of this paper is to examine whether these hypotheses for the use of derivatives can explain the interest rate risk management (IRRM) practices of UK companies. A novel feature of this research is that it employs a qualitative approach to investigate the importance of these hypotheses to UK companies. In particular, the paper presents an analysis of the responses to an in-depth questionnaire that was sent to a large sample of UK firms. Such an approach facilitates an examination of the IRRM practices of companies on an individual basis as opposed to the aggregated analysis afforded by most finance research that adopts a more quantitative approach. In addition, the use of a qualitative approach may yield new explanations of observed corporate practices that may not yet be documented in the substantive literature.

The remainder of the paper is organised as follows. The next section reviews the hedging hypotheses advanced in the literature while, thereafter, the research method is described and the empirical results of the research are presented. The final section offers a number of concluding observations.

Literature review

The risk of a firm often depends upon the volatility of its future cashflows (Lumby and Jones, 2003) and, the more variable the possible future outcomes for the firm, the higher its level of risk. The textbook definition of risk includes both the downside effects of uncertain outcomes as well as their upside potential. However, managers and investors are often more concerned with just the downside effects of risk, and where possible, will seek to protect any upside benefits (Meulbroek, 2002). This behaviour gives rise to an alternative definition of risk from that of the neo-classical version and, importantly, companies' risk management strategies will differ depending upon the definition of risk applied. The definition itself may be a function of the individual circumstances facing the firm and the relative costs of managing the risk that arises from one definition over that which arises from another (Meulbroek, 2002). However, Guay and Kothari (2003) argue that all risk management strategies can be slimmed down to the management of three risk exposures: the volatility of cashflows; the volatility of income; and the volatility of firm value.

IRRM is concerned with managing the effect of movements in interest rates on these three risk exposures. IRR may manifest itself in several different ways. First, variable interest rate debt may raise the funding cost for firms when interest rates rise and this may, in turn, affect their bottom line earnings levels. Furthermore, where the magnitude of interest rate rises are considerable, firms may suffer financial distress. This risk will undoubtedly be reflected in the share price. Second, and conversely, yields on firms' short-term investments will decline in a period of falling interest rates. Cash-rich companies may find that declining interest rates prove costly to them, impacting the variability of their cashflows, bottom line earnings and, ultimately, their share price. Third, high levels of fixed-rate funding during periods of low, or declining, interest rates will result in an opportunity cost whereby high fixed-rate debt companies will pay a higher rate of interest than their competitors. Again, this situation will have a negative impact on the share price. Even though this risk may result in a considerable competitive disadvantage through excess costs, it remains unreported in the annual financial statements of companies and may, in turn, detract managerial attention due to the resulting void in accountability. Finally, a rise in interest rates may adversely influence the demand patterns of some firms' products and, in turn, their operating cashflows. For example, financial institutions that provide mortgages for house purchases, and luxury product manufacturers, may find it more difficult to sell their products when interest rates are high. These factors will again manifest themselves in the share price if IRRM is not undertaken.

A number of reasons have been advanced in the substantive literature to explain why companies might choose to hedge financial risk and this paper focuses on five of them: tax and regulatory arbitrage; reducing the variability in reported earnings; financial distress; managerial incentives; and economies of scale. With respect to tax and regulatory arbitrage, some commentators argue that taxation can affect the hedging decisions of companies. They suggest that because of the progressive taxation

system, as company profits increase, the tax rate rises at a faster pace. It may be more efficient, therefore, to try and smooth each year's earnings through hedging so that higher tax rates are not levied on any one year's profits; companies can hedge to ensure that the same tax rate is maintained in consecutive years. According to proponents of this strategy, hedging through the use of derivatives may result in companies paying less tax as compared with those that do not manage their IRR (Rawls and Smithson, 1990; Froot *et al.*, 1993; Graham and Smith, 1999).

A similar argument can be made for regulatory arbitrage (Smith and Stulz, 1985; Eckl and Robinson, 1990). Companies may actively engage in trying to avoid regulatory hurdles, such as the excessive costs incurred when raising new finance, by obtaining funding in a market or currency other than the domestic market. Thus, a company based in the USA may raise funds through the Euromarkets in a currency other than dollars and then hedge the mismatch in currency flows using currency swaps.

The second reason for hedging relates to the under-investment problem of firms that need to minimise the volatility in their cashflows and earnings to ensure that the firm can plan its future. The Modigliani and Miller argument suggests that companies do not need to hedge because value is only created when companies make positive net present value investments; the choice of funding has no impact on the value of the firms. However, Froot *et al.* (1994) note that companies need to predict what their cashflows will be in order to be able to make these investments. Froot *et al.* (1993) also suggest that if firms do not hedge their risks, then variations in the cash inflows earned by the assets may lead to variability in investments or may compel the firm to raise finance through external funding. Essentially, firms have two sets of cashflows to meet:

- (1) investment in their operations to promote growth; and
- (2) the payment of dividends.

Without hedging, companies may be forced to under-invest because it will be costly or impossible to raise new finance and managers may not wish to cut dividends as such a cut would be viewed negatively by the capital market (Lintner, 1956; Pettit, 1972; Lonie *et al.*, 1995; Gunasekarage and Power, 2002)[1]. Thus, companies are likely to manage their reported profits and protect their businesses against economic cycles.

The third argument for hedging is that it reduces the possibility of financial distress (Stultz, 1996). Rawls and Smithson (1990) suggest that if risk management reduces cashflow variability then the probability of financial distress is lowered. Financial distress may not necessarily mean bankruptcy, but it may increase the operating costs of the firm since no credit might be available from suppliers and loans might only be offered at a higher rate of interest. In addition, customers might demand service agreements or warranties, and the wages paid to retain employees might need to rise. Nance *et al.* (1993) argue that smaller companies are more likely to hedge risks when:

- their probability of becoming financially distressed is high; and
- the costs of financial distress that they might incur are large.

Froot *et al.* (1993) support this view and note that hedging also reduces the probability that a company will default on its debt repayments and, therefore, lower the possibility of bankruptcy[2],[3]. Further, companies that do not have any short-term

liquidity constraints can also reduce the probability of financial distress, and are able to plan with more certainty their future positive net present value investments. Thus, it is expected that companies with high gearing, low interest cover, large debt levels and poor financial ratios are more likely to hedge.

The fourth argument for hedging that is examined in this paper is based on the twin notions of managerial self-interest and managerial risk aversion that is rooted in agency theory (Smith and Stulz, 1985). Froot *et al.* (1993) propose that the labour market revises its opinions about managers' ability based on the performance of the company where they work. By hedging, executives can smooth the earnings of the company and influence the labour market's perception of their talents. Stulz (1984) argues that it is managers (agents) who decide upon hedging policy rather than shareholders (principals) and those managers might hedge to maximise their expected lifetime utility by reducing the possibility that they might be compelled to leave the firm. Managers cannot diversify the unique risk which is specific to their organisation since they tend not to have a diversified portfolio of investments but, instead have a large proportion of their human capital tied up in one firm (Donaldson, 1963)[4]. Thus, managers are likely to try and take advantage when their expectations differ from the market or where they believe that they can take advantage of market trends. Further, the more diverse a company's operations, the more scope there is for managers to adopt different strategies and undertake alternative forms of hedging: for example, internal hedging, cross hedging and natural hedging. Thus, companies are likely to act upon situations where they think that they have a different view from the markets and possibly have some information asymmetry.

The final argument for the use of hedging draws on the notions of contracting costs and economies of scale (Mian, 1996). Nance *et al.* (1993) suggest that there are scale economies in the costs associated with derivatives transactions that make it cheaper for larger firms to hedge. Large companies can take advantage of these economies of scale; they are more likely to employ professional managers who are familiar with hedging than are smaller firms that will tend to employ non-specialist financial staff. Studies of non-financial firms in the USA and New Zealand have shown that derivatives usage is often related to company size. In particular, Bodnar *et al.* (1995) and Prevost *et al.* (2000) find that the risk exposures of smaller firms is often tiny relative to standard contract sizes, and that larger firms have a greater range of exposures for which derivatives may be needed. However, other studies in the USA and Germany have found that derivatives usage is consistent over all size groups (Bodnar and Gebhardt, 1998).

The findings of studies that have examined the hedging hypotheses have been fairly mixed, and the country where the study is conducted can often affect the results; for example, tax regimes and regulatory requirements vary from country to country and influence derivative usage. In sum, the literature has documented mixed findings regarding the reasons why companies' hedge and the only consistent finding is that larger companies take advantage of their economies of scale. This research adds to this debate by examining which of these reasons appear to explain the interest rate hedging activities of UK companies.

Research method

Many finance studies employ archival empirical data to test theories and hypotheses. However, such studies cannot document the behaviour of participants in the markets and there are often problems with specifying and measuring variables. In addition, some variables may proxy for many competing hypotheses (Graham *et al.*, 2005). The benefits of using a questionnaire survey are that new explanations of observed practices may be found and assumptions underlying any competing theories can be examined in more detail (Graham and Harvey, 2001; Pike and Cheng, 2001; Helliar *et al.*, 2002; Graham *et al.*, 2005). Further, questionnaires provide disaggregated data that can be used to examine the practices of firms on an individual basis rather than on an aggregated basis.

This paper analyses the responses from a questionnaire survey that was sent to the treasurers of 564 UK listed companies in the summer of 2003[5]. The sample firms included a random selection of non-financial firms, comprising 136 companies included in the top 350 FTSE share index, 353 other firms quoted on the Official List and 75 companies quoted on AIM. This selection of firms was used to obtain views from a range of companies that differed in terms of size and industry membership. Two different questionnaires, questionnaire A and questionnaire B, were sent to the sample firms[6]. The reason for designing two questionnaires was that a single one would have been too lengthy and, consequently, may have resulted in a low response rate. It also allowed different questions to be asked that may have affected the response rate (Helliar *et al.*, 2002; Graham *et al.*, 2005). Both questionnaires contained a large and varied number of questions, although a significant proportion was common to both. Questions were generally close-ended and required respondents to select a response from a pre-determined set of responses, usually based on a five-point Likert scale although, on occasion, open-ended questions also featured to seek opinions and explanations from respondents. Two hundred and eighty four (50 per cent) replies were received, of which 166 (29 per cent) were completed and useable; the remaining 118 (21 per cent) were letters declining to participate in the study. Table I provides details of the questionnaire respondents.

In general, there was no difference in the response levels between questionnaires A and B for either the total sample or for each of the three specific groups of companies[7]. The response rate for the top 350 group was the highest at 52 per cent, followed by that for the Official List at 24 per cent and, finally, the AIM companies at 12 per cent. The difference in the response rates may reflect the difference in the significance of IRRM to these companies. Specifically, companies from the top 350 group may be more concerned with IRR, or may have more specialised resources in place to manage this risk, as compared to their counterparts listed on AIM[8],[9].

Findings

The questionnaire asked company respondents why they sought to manage their IRR. These questions were used to distil which of the hedging theories are relevant to practitioners, and the "Theory" column in Table II shows the theory to which each statement relates. The most important reason, as highlighted by Table II, was that of managing reported profits; it had a mean of 2.343 on a five-point Likert scale where a 1 was "important" and a 5 was "unimportant". Thus, finance executives wish to smooth the bottom line earnings number to ensure that earnings are not volatile and that they

Reason	Theory	No.	Mean	Std. Dev.	<i>p</i> -value
To manage reported profits	MI	73	2.343	0.885	0.000
To protect shareholder funds	FD	72	2.512	1.048	0.000
The interest charge to EBIT/EBITDA is significant	FD	73	2.644	1.060	0.005
The interest charge to EPS is significant	FD	72	2.792	1.060	0.100
A high interest charge relative to operating profit	FD	73	2.904	1.120	0.467
The balance sheet structure requires managing	FD	73	2.930	0.900	0.512
A high absolute level of borrowing	FD	72	2.944	1.197	0.695
To manage possible future acquisitions	VU	72	2.958	0.971	0.717
To protect gearing	FD	72	3.028	0.978	0.810
Close to its banking covenants	FD	73	3.041	1.047	0.738
Reported profits are sensitive to interest rate changes	VU	72	3.042	1.054	0.738
The business is affected greatly by the economic cycle	FD	73	3.096	1.056	0.440
Cashflow streams are sensitive to interest rate changes	VU	73	3.110	1.035	0.369
To reduce credit risk	FD	73	3.151	0.953	0.181
To minimise tax payments	TR	73	3.164	0.928	0.135
To implement an intensive capital spending programme	VU	72	3.347	0.966	0.003
To maintain a high dividend payout ratio	MI	71	3.409	0.888	0.000
Remitted profits are sensitive to interest rate changes	FD	72	3.444	0.933	0.000
A slow rate of debt repayment	FD	73	3.466	0.973	0.000
Poor financial ratios	FD	57	3.493	0.988	0.000
The business is likely to change fundamentally	MI	73	3.521	0.974	0.000
Market value of assets is sensitive to interest rate changes	FD	73	3.671	0.944	0.000
The chance of a credit downgrade is high	FD	73	3.740	0.972	0.000
Book value of assets is sensitive to interest rate changes	FD	73	3.753	0.847	0.000

Notes: The table details the importance of several reasons that explain why companies manage IRR based on the theories of financial distress (FD), managerial incentives (MI), tax and regulatory arbitrage (TR) and minimising volatility and avoiding under-investment (VU). In particular, the table shows the number of respondents to each question (No.) and the mean response (Mean) on a five-point Likert scale, where a 1 was “important” and a 5 “unimportant”. In addition, the table details the standard deviation (Std. Dev.) and the *p*-value from a *t*-test that was conducted to see how different the mean responses were from the neutral response of 3. The table shows the reasons, ranked in mean order, from the most important to the least important

Table II.
Reasons why companies
manage interest rate risk

meet the consensus of earnings expectations in the market (Graham *et al.*, 2005). However, the next six most important items related to the financial distress hypothesis as companies try to protect shareholder funds, earnings per share (EPS) and profits from a hike in interest rates. The next ranked item related to managing possible future acquisitions and, as such, supports the hypothesis that managers manage risks to carry out future strategies.

Table II also shows that a number of reasons for managing IRR were not important; several reasons had means well above three. In general, these reasons related to financial distress factors and managerial incentives. While studies based on aggregated data find that both of these two theories are supported or not supported, this more qualitative research shows that there are many elements to these theories

and that some factors support the hypotheses but others do not. The only theory for which there was no support was the tax and regulatory arbitrage theory. Table II clearly shows that respondents did not manage IRR to minimise tax payments; this reason had a mean of 3.164.

These twenty four reasons for managing IRR were analysed using principal components analysis (PCA) to establish whether they could be distilled down into core reasons. Panel A of Table III shows that the first six principal components (PCs) had an eigenvalue greater than 1 and explained nearly three-quarters of the variation in the data. Panel B of the table summarises the factor loadings of the PCs. The table shows that PC 1 primarily reflects the financial distress hypothesis as it has high factor loadings with the statements representing this hypothesis. Similarly, PC2 represents the tax motivation, PC3 proxies for managerial incentives and business strategy, PC4 represents managing the bottom line and PC5 is financial distress related to covenants. Finally, managerial incentives and strategy related to future opportunities is represented by PC6. Thus, these 24 factors can be distilled into six components that represent the first four hypotheses that explain why UK companies manage IRR.

The questionnaire respondents were also asked about their views on how the markets influenced IRRM and the decisions that they might make based on their view of market expectations. Relevant results are shown in Table IV. The respondents viewed all of the statements as important; with the exception of one statement (the yield curve helps to predict swap spreads) all of the statements had a mean of less than 3, although responses to the last six statements were only mildly supportive. These statements all reflect the first four theories. For example, agreement with the statement that highly geared companies close to covenant limits will undertake risk management by fixing their interest stream is supportive of the financial distress hypothesis. Similarly, agreements with the statements that firms that have more floating-rate finance are more likely to experience volatility in the bottom line earnings figure is supportive of the under-investment/ensuring a steady cashflow hypothesis. The fact that managers will fix their interest rates if they think the yield curve under-prices interest rates implies that management are trying to enhance their reputation externally by taking decisions that could result in a big payoff. Finally, the tax and regulatory arbitrage theory is only mildly supported by the fact that managers will use the Eurobond market to arbitrage the costs of transacting in the US markets.

The factors in Table IV were also analysed using PCA but the results did not provide any satisfactory explanations. However, when just the large companies were examined, there were six eigenvalues with values greater than one as shown in Panel A of Table V. From Panel B of the table, the six factors represented by the PCs were: using the yield curve to fix rates (PC1); closeness to covenants will result in balance sheet management and the use of the bond market (PC2); floating rate finance is cheaper (PC3); analysts forecasts are poor (PC4); the usefulness of the zero-coupon yield curve (PC5); and the use of the yield curves to predict rates (PC6). All of these factors support the managerial incentive and strategy theory with the exception of PC2 which supports the financial distress theory. Thus, there was very strong support for the managerial incentive argument from the large respondents in the survey.

Table VI shows the responses to questions asking about the importance of various economic variables in order to assess whether companies are concerned about

	PC1	PC2	PC3	PC4	PC5	PC6	Interest rate risk management
<i>Panel A</i>							
Eigenvalue	9.18	2.77	1.66	1.52	1.19	1.11	
percentage of variance explained	38.20	11.60	6.90	6.30	5.00	4.60	
Cumulative (per cent)	38.20	49.80	56.70	63.00	68.00	72.60	
<i>Panel B</i>							
A high absolute level of borrowing (FD)	0.638	-0.321	0.290	0.042	0.469	0.073	
A high interest charge relative to operating profit (FD)	0.779	-0.248	0.281	-0.009	0.278	0.114	
A slow rate of debt repayment (FD)	0.676	-0.432	0.016	-0.121	0.394	-0.035	
Book value of assets is sensitive to interest rate changes (FD)	0.696	-0.313	-0.017	-0.232	0.009	0.108	
Close to its banking covenants (FD)	0.672	-0.544	-0.083	0.060	0.051	-0.051	
Market value of assets is sensitive to interest rate changes (FD)	0.570	-0.104	0.166	0.200	-0.167	-0.455	
Poor financial ratios (FD)	0.645	-0.359	0.203	0.185	-0.373	-0.166	
Remitted profits are sensitive to interest rate changes (FD)	0.739	-0.427	-0.123	0.093	-0.276	-0.040	
The balance sheet structure requires managing (FD)	0.597	-0.021	0.345	-0.210	-0.086	-0.195	
The business is affected greatly by the economic cycle (FD)	0.573	0.019	0.193	0.202	-0.363	0.493	
The chance of a credit downgrade is high (FD)	0.461	0.074	0.554	0.154	-0.290	0.455	
The interest charge to EBIT/EBITDA is significant (FD)	0.507	0.069	-0.378	0.432	-0.110	-0.224	
The interest charge to EPS is significant (FD)	0.777	-0.014	-0.018	0.250	0.034	-0.119	
To protect gearing (FD)	0.639	0.002	0.259	0.103	0.063	-0.142	
To protect shareholder funds (FD)	0.382	0.365	-0.227	0.541	0.004	0.160	
To reduce credit risk (FD)	0.418	0.564	0.153	0.368	0.310	0.087	
The business is likely to change fundamentally (MI)	0.314	0.766	0.228	0.095	0.119	-0.248	
To maintain a high dividend payout ratio (MI)	0.487	0.481	0.044	-0.254	-0.074	-0.098	
To manage reported profits (MI)	0.630	0.363	-0.040	0.015	0.094	-0.159	
To minimise tax payments (TR)	0.704	0.248	0.013	-0.379	-0.230	-0.092	
Cashflow streams are sensitive to interest rate changes (VU)	0.742	0.279	-0.010	-0.450	-0.154	-0.035	
Reported profits are sensitive to interest rate changes (VU)	0.654	0.244	-0.459	-0.143	0.080	0.243	
To implement an intensive capital spending programme (VU)	0.667	0.301	-0.242	-0.355	0.005	0.152	
To manage possible future acquisitions (VU)	0.587	0.003	-0.574	-0.007	0.214	0.211	

Notes: This table shows the results of a PCA that was applied to the 24 hedging reasons. Panel A of the table details the eigenvalue and the percentage of variation explained by each PC. The cumulative percentage of variation explained by the PCs is also shown. Panel B of the table shows the factor loadings for each reason in each PC. The reasons explain why companies manage IRR and are based on the theories of financial distress (FD), managerial incentives (MI), tax and regulatory arbitrage (TR) and minimising volatility and avoiding under-investment (VU)

Table III. Reasons why companies manage interest rate risk: results from a principal components analysis

Factor	No.	Mean	Std. Dev.	P-Value
Companies with overseas assets that are revenue generating will have debt in those currencies (TR)	79	2.215	0.779	0.000
The more floating rate finance, the greater the volatility in the bottom line earnings figure (VU)	78	2.256	0.973	0.000
Highly geared companies, close to covenants limits, will have more fixed rate finance (FD)	79	2.346	0.895	0.000
If the market predicts that rates will rise more than you think, any protection to hedge will be expensive (MI)	79	2.418	0.871	0.000
A company is more likely to manage its balance sheet if it is weak or it is approaching its banking covenants (FD)	78	2.449	1.002	0.000
If you think the yield curve under-prices interest rates, you are more likely to be fixed (MI)	78	2.474	0.864	0.000
The zero coupon swap curve is useful (MI)	77	2.494	0.641	0.000
Analysts forecasts of interest rates are poor (MI)	78	2.615	0.707	0.000
I am more likely to hedge if the yield curve is advantageous (MI)	78	2.709	0.963	0.000
If the yield curve is downward sloping, a firm is more likely to have a greater percentage of fixed rate debt (VU)	79	2.861	0.971	0.206
The more floating rate finance, the less interest that is ultimately paid (MI)	79	2.861	1.152	0.286
The Eurobond market is cheaper and easier to use than the US bond market (TR)	79	2.886	0.832	0.227
The recent credit crunch has resulted in companies using the bank credit market more than bonds (VU)	79	2.924	0.797	0.400
Yield curves are the best predictors of future interest rates (MI)	79	2.949	0.918	0.626
The bond market is cheaper to raise finance in and is longer term and less restrictive than banks (TR)	79	2.949	1.120	0.689
The yield curve helps to predict swap spreads (MI)	78	3.064	0.858	0.511

Notes: The table details the importance of several factors that affect IRRM based on the theories of financial distress (FD), managerial incentives (MI), tax and regulatory arbitrage (TR) and minimising volatility and avoiding under-investment (VU). In particular, the table shows the number of respondents to each question (No.) and the mean response (Mean) on a five-point Likert scale, where a 1 was "important" and a 5 "unimportant". In addition, the table details the standard deviation (Std. Dev.) and the *p*-value from a *t*-test that was conducted to see how different the mean responses were from the neutral response of 3. The table shows the factors, ranked in mean order, from the most important to the least important

Table IV.
Factors affecting interest rate risk management

managing the risk against market volatility. The table shows that 21 of the 26 items were important to the surveyed companies, with means below 3 on a 5-point Likert scale, where a 1 was "important" and a 5 was "unimportant". The most important factors were UK base-rate changes and the pound sterling exchange rate. These economic variables had means below 2. This finding demonstrates that, despite the globalisation of world trade, UK financial managers are worried about economic factors, especially in the UK, the USA and, to a lesser degree, the Eurozone. Surprisingly, oil price increases did not appear to be as important although, at the time

	PC1	PC2	PC3	PC4	PC5	PC6
<i>Panel A</i>						
Eigenvalues	2.67	2.13	1.88	1.49	1.27	1.09
percentage of variance explained	16.70	131.30	11.80	9.30	7.90	6.80
Cumulative (per cent)	16.70	30.00	41.80	51.10	59.00	65.80
<i>Panel B</i>						
A company is more likely to manage its balance sheet if it is weak or it is approaching its banking covenants (FD)	0.642	0.049	-0.241	-0.261	0.098	-0.218
Highly geared companies, close to covenants limits, will have more fixed rate finance (FD)	0.073	-0.163	-0.524	0.371	0.408	0.116
The recent credit crunch has resulted in companies using the bank credit market more than bonds (FD)	0.227	0.489	-0.191	-0.262	-0.167	0.564
Analysts forecasts of interest rates are poor (MI)	-0.021	0.404	-0.385	-0.187	-0.628	-0.214
I am more likely to hedge if the yield curve is advantageous (MI)	0.723	-0.283	0.085	-0.096	-0.087	-0.013
If the market predicts that rates will rise more than you think, any protection to hedge will be expensive (MI)	0.011	0.443	0.154	0.537	0.009	-0.116
If you think the yield curve under-prices interest rates, you are more likely to be fixed (MI)	0.108	-0.049	0.712	-0.317	0.213	0.417
The more floating rate finance, the less interest that is ultimately paid (MI)	0.495	-0.287	0.015	0.465	0.177	-0.137
The yield curve helps to predict swap spreads (MI)	0.778	-0.098	-0.056	0.016	-0.341	-0.078
The zero coupon swap curve is useful (MI)	0.531	-0.211	0.282	-0.324	0.099	-0.297
Yield curves are the best predictors of future interest rates (MI)	0.113	0.622	0.330	0.295	-0.203	-0.056
Companies with overseas assets that are revenue generating will have debt in those currencies (TR)	0.238	0.474	0.530	0.027	0.118	-0.224
The bond market is cheaper to raise finance in and is longer term and less restrictive than banks (TR)	0.563	0.239	-0.218	0.440	-0.054	0.359
The Eurobond market is cheaper and easier to use than the US bond market (TR)	0.683	0.659	-0.021	-0.046	0.461	-0.211
If the yield curve is downward sloping, a firm is more likely to have a greater percentage of fixed rate debt (VU)	0.380	0.147	-0.219	-0.194	0.266	0.302
The more floating rate finance, the greater the volatility in the bottom line earnings figure (VU)	0.036	-0.402	0.506	0.369	-0.338	0.227

Notes: This table shows the results of a PCA that was applied to the 16 factors affecting IRRM. Panel A of the table details the eigenvalue and the percentage of variation explained by each PC. The cumulative percentage of variation explained by the PCs is also shown. Panel B of the table shows the factor loadings for each statement in each PC. The factors affecting IRRM are based on the theories of financial distress (FD), managerial incentives (MI), tax and regulatory arbitrage (TR) and minimising volatility and avoiding under-investment (VU)

Table V. Factors affecting interest rate risk management: results from a principal components analysis

Economic variable	No.	Mean	Std. Dev.	<i>p</i> -value
UK base-rate rises	79	1.823	0.781	0.000
UK base-rate falls	78	1.846	0.701	0.000
UK £ exchange rate strengthening	79	1.962	0.940	0.000
UK £ exchange rate weakening	79	1.962	0.884	0.000
US \$ exchange rate weakening	77	2.169	1.056	0.000
US \$ exchange rate strengthening	77	2.182	1.035	0.000
Euro exchange rate strengthening	78	2.218	0.989	0.000
Inflation rates rising	78	2.256	0.763	0.000
Deflation	78	2.256	0.829	0.000
Euro exchange rate weakening	77	2.270	0.976	0.000
Inflation rates falling	78	2.372	0.824	0.000
US\$ interest rate rises	79	2.494	1.218	0.000
Positive yield curve steepening	75	2.507	0.844	0.000
US\$ interest rate falls	78	2.525	1.214	0.001
Euro currency interest rate rises	78	2.526	1.113	0.000
Euro currency interest rate falls	79	2.531	1.119	0.000
Negative yield curve steepening	75	2.533	0.811	0.000
Yield curve flattening	75	2.547	0.826	0.000
Other raw material price increases	77	2.623	1.077	0.003
Credit spreads widening	75	2.627	0.969	0.001
Credit spreads narrowing	76	2.697	0.952	0.007
Oil price increases	77	2.766	1.297	0.118
Other exchange rates strengthening	78	2.920	1.067	0.521
Other exchange rates weakening	76	2.948	1.087	0.676
Other currency interest rate rises	75	3.240	1.172	0.080
Other currency interest rate falls	75	3.253	1.626	0.063

Notes: This table details the importance of several economic factors that affect IRR. In particular, the table shows the number of respondents to each question (No.) and the mean response (mean) on a five-point Likert scale, where a 1 was “important” and a 5 “unimportant”. In addition, the table details the standard deviation (Std. Dev.) and the *p*-value from a *t*-test that was conducted to see how different the mean responses were from the neutral response of 3. The table shows the economic variables, ranked in mean order, from the most important to the least important

Table VI.
The importance of various economic variables

of this survey, the oil price was not an issue. These results imply that managers review global economic indicators and will take action to nullify the consequences of adverse economic movements to protect the bottom line earnings number and to protect against financial distress[10].

To manage IRR companies can use both internal and external hedging methods. Managers are likely to use external derivative markets if there is a managerial incentive to do so. Table VII reports the extent to which certain derivative instruments are used to hedge IRR. The question was framed as a 5-point Likert scale where a 1 was “always” and a 5 was “never”. Interest rate swaps were clearly the most often used product, with a mean score of 2.506. Forward rate agreements (FRAs) and caps were sometimes used, with mean scores in the range of 3 to 4. All of the other products listed in the questionnaire, such as collars, floors, futures and options, were either used only rarely or never used at all. This finding was particularly true for exchange-traded products. Interestingly, the standard deviations decrease as the means increase,

Derivative product used	No.	Mean	Std. Dev.
Interest rate swaps	158	2.506	1.276
Forward rate agreements	153	3.497	1.231
Buying caps	150	3.880	1.029
Buying collars	149	4.114	0.941
Buying interest rate options	149	4.275	0.958
Buying floors	144	4.347	0.895
Selling interest rate options	147	4.415	0.905
Buying structured derivatives	146	4.469	0.842
Buying swaptions	146	4.507	0.763
Selling floors	145	4.586	0.787
Selling caps	145	4.600	0.785
Selling collars	144	4.653	0.732
Buying interest rate futures	145	4.772	0.695
Selling interest rate futures	145	4.786	0.679
Selling exchange traded options	144	4.847	0.492
Buying exchange traded options	144	4.854	0.487

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Notes: This table details the importance of derivatives used for IRRM. In particular, the table shows the number of respondents to each question (No.), the mean response (Mean) on a five-point Likert scale, where a 1 was “important” and a 5 “unimportant” and the standard deviation (Std. Dev.). The table shows the derivative products, ranked in mean order, from the most important to the least important

Table VII.
The derivative products
used

showing that there is more general agreement about the non-use of exchange-traded futures and options than the frequent use of interest rate swaps.

The use of swaps is unsurprising since swaps are one of the only medium – to long-term instruments available to hedge long-maturity products such as bank loans and bonds, and this finding also supports other studies that show that interest rate swaps are widely used (Helliari, 1997). The use of FRAs is similar to that of the management of foreign exchange rate risk where forward contracts take precedence (Helliari, 1997). The dislike of exchange-traded products also confirms prior studies (Bodnar *et al.*, 1995; Helliari, 1997), and reflects the fact that managers like the flexibility of tailor-made products that suit their particular circumstances and preferences, supporting the managerial incentive hypothesis[11].

The evidence presented so far has focused on the first four theories (financial distress, minimise volatility in earnings and avoid under-investment, managerial incentives, tax and regulatory arbitrage) of why companies manage financial risk. The fifth theory is that of economies of scale and size. Most studies of risk management practices find that size is a key reason why companies hedge, with larger companies adopting many risk management practices and smaller companies less likely to do so (Nance *et al.*, 1993; Bodnar *et al.*, 1995; Mian, 1996; Prevost *et al.*, 2000).

To examine whether there is a difference in the hedging practices of large and small firms, *t*-tests were performed on the questionnaire responses between large and small companies. Table VIII shows the difference for questions that were repeated in both questionnaires where there was a significant difference between the two size categories[12]. The table highlights that smaller companies are less likely to have any credit-rated debt, possibly because smaller firms do not have the resources to obtain

Description Questionnaires A and B	Small		Large		<i>p</i> -value
	No.	Mean	No.	Mean	
Are derivatives used to change the debt profile?	89	1.40	73	1.12	0.000
Are structured derivatives used?	80	4.65	65	1.24	0.005
Are bank packages taken apart?	86	1.55	67	1.28	0.001
Is there any credit-rated debt?	88	1.85	72	1.33	0.000
Are borrowings swapped?	86	1.92	69	1.53	0.000
Is borrowing mainly in pounds?	80	1.55	69	2.08	0.003
Are interest rate swaps used?	86	2.86	72	2.08	0.000
Are internal hedging techniques used?	86	2.52	70	2.24	0.018
Does the company pay fixed or floating or both?	56	1.82	65	2.38	0.001
What percentage of bond financing is used?	83	1.47	70	2.81	0.000
Are swaptions used?	81	4.67	65	4.31	0.006

Notes: This table details the effect of size on the reasons for hedging. In particular, the table shows the number of respondents to each question (No.) and the mean response (Mean) on a five-point Likert scale, where a 1 was “important” and a 5 “unimportant”. The *p*-value shows the significance of the difference in responses between the two groups. Large firms are defined as those companies with a turnover of over £1bn and small firms include those companies with a turnover of less than £1bn. The table shows the hedging reasons, ranked in mean order for the large companies, from the most important to the least important

Table VIII.
Differences between
small and large
companies

credit-ratings from outside agencies such as Standard and Poors, Moodys or Fitch. Larger companies are more likely to use derivatives to change the maturity profile of debt than smaller companies, although there is still a tendency for both sizes of company to use them. Visibly, one of the largest differences in responses between large and small companies is that of bond versus bank financing; smaller companies are much less likely to have bond financing than their larger counterparts. The lack of bond financing for smaller companies is probably also reflected in the absence of a credit rating for these firms. The currency of borrowing for smaller companies is also more likely to be in sterling, again reflecting the fact that larger companies probably have greater access to the global capital markets than smaller companies do. However, larger companies often borrow and swap the proceeds – thus the currency of borrowing after swaps is possibly similar to that of the smaller companies, but the larger companies have the resources to take advantage of any arbitrage opportunities as these windows appear. Larger companies also appear to have the resources to manage interest rates on an internal basis without having to resort to the external markets. The largest difference between the two categories of company is that larger firms are more likely to use exotic derivatives; this may be because of the existence of dedicated treasury departments in larger companies (Helliard *et al.*, 2005). The contrast in the mean response of small companies, at 4.65 (never use), and large companies of 1.24 (always use), is outstanding. Larger companies also use swaps more, but both appear only rarely to use swaptions, although again larger companies are more likely to use them.

This analysis shows that there are differences between larger and smaller companies; larger companies appear to have the resources to carry out more detailed IRRM and have the expertise to arbitrage between the markets. The findings are, therefore, supportive of the theory of economies of scale for financial risk management.

Conclusion

This study has examined five theories of why managers may undertake IRRM. The extant literature provides an array of studies that often conflict with each other about whether certain theories explain actual practice. This study has used a survey instrument to ask financial managers about their risk management on a daily basis to determine how relevant these theories are in practice. The findings from this study show that all five theories are supported in practice. However, the study found that some aspects of some theories command support, while other aspects of other theories do not. This finding may explain why so many different studies have competing views; depending upon the sample of companies and the different proxies that are used, different factors may be examined that either support or do not support a theory. Using a disaggregated questionnaire survey approach to study company motivations the paper has highlighted that corporate risk management is a complex practice, and many factors that affect the risk management approach adopted by firms in practice cannot be investigated through large datasets. Hopefully, more work of this nature will be undertaken in the future to examine corporate practices in more detail.

Notes

1. Nance *et al.* (1993) suggest that those firms with an abundance of growth options in their investment opportunity set are more likely to adopt a hedging programme aimed at reducing any variation in their firm's value. They also state that under-investment will be more pronounced among companies that have a large amount of debt in their capital structure. Thus, higher geared companies will be more likely to hedge.
2. However, Mian (1996) counters that there might be a conflict between bondholders and shareholders as to how the net present value of an investment should be shared. If bondholders receive all the return, the company may decide not to invest in a project. However, bondholders face the risk that managers might pay a dividend to shareholders that jeopardises the return available to bondholders. The price of the bond when it is issued reflects the expected return to each party. Hedging reduces the probability that the company will default on its bonds. Gearing is also important, as more highly geared companies are more likely to use derivatives to ensure that they can pay their contractual commitments.
3. In a UK context, Adedeji and Baker (2002) found that interest cover and financial leverage had a significant influence on the use of interest rate derivatives.
4. For example, Gilson (1989) found that none of the CEOs from the Fortune 500 firms who had lost their jobs because their companies got into financial distress were ever employed as executives in other Fortune 500 firms.
5. The first mailing was sent to the company treasurers in May 2003. A second mailing followed a few weeks later to the non-respondents. A letter was sent with the questionnaire asking non-respondents to outline their reasons for not participating in the study.
6. The questionnaires were sent at random to the chosen sample: questionnaire A was sent to companies with an odd ranking in the list and questionnaire B was sent to companies with an even ranking. The companies in the list were ranked according to their position on the markets.
7. Although the difference between questionnaires A and B for the AIM companies may appear significant (10 per cent and 15 per cent, respectively), the number of respondents is very small (4 and 5, respectively).

9. A larger percentage of AIM companies cited “no significant interest rate exposure/no active interest rate risk management policy” as their reason for not responding, as compared with companies from the top 350 FTSE share index.
9. To assess the importance of non-response bias, the Kruskal-Wallis test was used to compare the coefficients of variation of the responses to the 248 questions in the questionnaires of the early and late respondents. Only 9 questions (3.6 per cent) generated a significantly different coefficient between the two samples, indicating that there did not appear to be any response bias.
10. The respondents were also asked about their funding currency as companies may borrow in one currency and swap into another currency to arbitrage between the different spreads in the market thus taking advantage of regulatory arbitrage (Helliard, 1997). The results from the survey showed that the pound sterling was the most usual form of financing, closely followed by the US \$. The euro was also used widely but other currencies, including the Japanese Yen, were rarely used. Further, 68 per cent of companies indicated that sterling was their main or second most important funding currency, compared with 55 per cent and 38 per cent for the US \$ and €, respectively. These findings indicate that firms were very willing to fund in other currencies and thus take advantage of regulatory arbitrage opportunities.
11. As UK companies have had to adopt IAS 39 (FRS 26) since 1 January 2005, the respondents were asked whether their use of derivative products would change as a result of this accounting standard. If respondents agreed that they might change, then this would support the view that managerial incentives play a part in the decisions that managers make about interest rate risk management. Respondents were further asked about the hedge accounting rules under IAS 39/FRS 26 and whether this would also affect their policies and strategy. The results indicated that FRAs and swaps might be used less, but that options and swaptions would definitely be used less. In addition, the survey responses suggested that financial managers are likely to change their current practice based on accounting changes, even though there is no economic reason to do so given the fact that real cashflows will not be affected. In summary, these results provide clear evidence of managerial incentives playing a significant role in the interest rate risk management decisions of UK companies.
12. Large firms are defined as those companies with a turnover of over £1bn and small firms include those companies with a turnover of less than £1bn.

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