



Risks and financing decisions in the energy sector: An empirical investigation using firm-level data [☆]



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HIGHLIGHTS

- I examine the effect of uncertainty on the UK energy firms' leverage decisions.
- Both firm-specific and macroeconomic uncertainty have negative effects on leverage.
- Firm profitability plays an important role in uncertainty–leverage relationships.
- The total effect of uncertainty on leverage varies with changes in profitability.

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ABSTRACT

Using a sample of 102 UK energy firms over the period 1981–2009, this paper empirically examines the effects of uncertainty on firms' leverage decisions. The results indicate that both firms-specific and macroeconomic uncertainty have negative, sizeable, and statistically significant impacts on the UK energy sector firms' target leverage. The results also indicate that the profitability of energy firms plays an important role in uncertainty–leverage relationship by changing the (total) effect of uncertainty on leverage. While more profitable firms appear to reduce their leverage by a relatively large amount in response to increased macroeconomic uncertainty, they are less likely to be affected by firm-specific uncertainty. These results suggest that stability in macroeconomic conditions and business activity is important to the stability of the capital structure of firms in the energy sector which would in turn be conducive to stability in their investments and production.

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1. Introduction

This paper extends the literature on the relationship between uncertainty and firm leverage by examining the impact of unexpected variations in firms' earnings (firm-specific uncertainty) and macroeconomic conditions (macroeconomic uncertainty) on the UK energy sector firms' leverage decisions. The paper also examines the indirect effect of both types of uncertainty on leverage through firms' profitability: an issue which has not been explored yet. How does risk influence firms' capital structure decisions? Capital structure theories offer alternative answers to this question. The trade-off theory postulates a negative relationship between idiosyncratic (firm-specific) risk and the target level of firms' leverage (Castanias, 1983; Bradley et al., 1984). In contrast, according to the agency costs theory, risk has a positive impact on firms' borrowing decisions (Myers, 1977).

Several recent theoretical papers have given this long-standing issue a fresh perspective. Broadly speaking, this new work examines the response of firm leverage to unpredictable variations in macroeconomic conditions and posits that firms' leverage decisions are pro-cyclical. Specifically, Hackbarth et al. (2006) predict that firms' borrowing capacity is pro-cyclical and that both the pace and the size of capital structure changes depend on macroeconomic conditions. Levy and Hennessy (2007) argue that firms are more likely to reduce their outstanding debt in periods of poor macroeconomic conditions. Likewise, Chen (2010) and Bhamra et al. (2010) show that unpredictable variations in macroeconomic conditions reduce tax benefits of debt by increasing discount rates and deteriorating expected cash flows. The reduction in tax benefits related to debt makes debts unattractive for firms and thus, they reduce the use of debt in their capital structure.

Despite corporate finance scholars have successfully established a theoretical relationship between macroeconomic risk and firms' financing policy, we have surprisingly little evidence on empirical grounds. There are only few studies that empirically investigate the influence of macroeconomic risk on firm leverage (i.e., Hatzinikolaou et al., 2002; Baum et al., 2009; Caglayan and

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Rashid, 2013). A common finding of these studies is the evidence of a negative relationship between firms' leverage and macroeconomic risk. Empirical findings on the association between firm-specific risk and firms' leverage decisions are also inconclusive. Some studies such as Lemmon et al. (2008), Antoniou et al. (2008), and Baum et al. (2009) document evidence of a negative relationship between firm-specific risk and leverage, while others including Toy et al. (1974), Kim and Sorensen (1986), Kale et al. (1991), Chu et al. (1992), and Mueller (2008) arrive at opposite conclusions. Yet, studies such as Flath and Knoeber (1980), Wald (1999), and Cassar and Holmes (2003) report statistically insignificant effects of firm-specific risk on the leverage decisions of firms.

Reviewing the literature we find that the impacts of risk on leverage have mainly been tested for US non-financial firms. However, the questions as to the whether these arguments are valid for non-US firms and whether the documented effects of risk on leverage hold for individual industries have received limited attention. It is well documented in the literature that industry-specific characteristics are significant in determining firms' investment and financing decisions (Mackay and Phillips, 2005). Therefore, the effects of risk on capital structure may worth exploring for a specific industry. Another shortcoming to the existing literature on the influence of risk on leverage is that none of the prior studies considers the role of firm-specific variables, such as firm profitability, in the uncertainty–leverage nexus.

Concerning the subject under discussion, the purpose of this paper is to provide new insights on the uncertainty–leverage relationship in two aspects. First, the paper provides empirical evidence of the effects of firm-specific and macroeconomic risk on the capital structure decisions of energy firms. To carry out empirical investigation, this paper utilizes an annual panel dataset for a sample of 102 UK energy firms covering the period 1981–2009 and implements the robust two-step system-GMM estimator. Second, the paper examines the role of firms' profitability in the sensitivity of firms' leverage to uncertainty. Specifically, after confirmation of the presence of a significant negative relationship between firms' leverage and uncertainty, the paper estimates another model where an interaction term between both types of uncertainty and profitability variable is included. The latter aspect enables us to examine whether the effects of uncertainty on leverage become stronger or weaker when the profitability of a firm changes.¹

The examination of the uncertainty–leverage relationship for energy firms is rationalized on several grounds. UK energy firms significantly differ from other UK manufacturing firms, in particular regarding their capital structure. For example, the mean leverage of energy firms is about 34% (see Table A1 of the paper in appendix), while the corresponding figure for overall manufacturing firms is about 19% (see Ozkan, 2001). This difference indicates that the energy sector firms are more levered on an average as compared to their counterparts. Similarly, the UK energy sector firms have more tangible assets on an average in comparison to other UK manufacturing firms (Rashid, 2012). Since compared to intangible assets, such as goodwill, trademarks, and patents, tangible assets, such as property, plant, and equipment, are easy to value for outsiders, they have low information asymmetries between firms' management and outside lenders. This low tangible assets-related information asymmetry reduces the cost of issuance of new equity. Therefore, energy firms having higher

tangibility may find it relatively ease to issue equity in order to reduce leverage when they experience risk. One should also note that energy firms' share prices on an average are higher than other firms because of continual increase in energy prices and demands. In principle, it is relatively favourable (cost-effective) for energy firms to raise funds from capital markets than bank financing. Further, since high levels of outstanding debt exposed firms to risk, firms prefer mix of debt and equity rather than only debt in their capital structure to share at least some risk with equity holders (Gertler and Hubbard, 1993). Given all these, the UK energy sector firms seem an interesting sample to examine the impact of firm-specific and macroeconomic risk on leverage decisions.

It should also be noted that the relation between economic growth and energy consumption/prices has become of great interest to researchers and policy-makers after the seminal work by Kraft and Kraft (1978). However, to the best of my knowledge, no empirical work has so far been done on how uncertainty about a firm's earnings and the overall macroeconomic conditions affect the capital structure decisions of firms in the energy sector. However, consideration of the effects of uncertainty on firms' financing policy is important for two reasons. First, the effects of firm-specific and macroeconomic uncertainty on firms' financing decisions distract firms' production and investment decisions, and thereby impact economic growth. This is also important because several empirical studies, mainly in the time series literature, provide statistical evidences that macroeconomic performance (economic growth) is significantly related to energy consumption and the dynamics of oil and gas prices.² Given this context, it would be useful to know how variations in macroeconomic activities impact the capital structure decisions of energy firms. Empirical evidence on the interactions of the leverage decisions of energy firms with macroeconomic uncertainty would definitely help to get the comprehensive understanding of the response of energy firms to macroeconomic dynamics. Indeed, the results presented in this paper suggest that uncertainty about firms' earnings and the overall macroeconomic environment is important for the capital structure decisions of the UK energy sector firms, and thus a key facet to take into account when making decisions to either go for external financing or use internally generated funds to finance their investments and other capital needs.

The remainder of the article is organized as follows. Section 2 presents the summary of predictions and prior empirical evidence on the effects of uncertainty on corporate capital structure. In Section 3, the empirical framework and estimation methods are discussed. Section 4 describes the data and variables, and discusses procedures that are applied to generate proxies for uncertainty. Section 5 presents and discusses the empirical findings in detail. Section 6 presents some conclusions.

2. Risk and financing decisions: predictions and prior empirical evidence

Several theoretical studies including Brealey and Myers (1981), Castanias (1983), and Bradley et al. (1984) predict a negative relationship between firms' leverage and firm-specific uncertainty. Specifically, the bankruptcy hypothesis of the trade-off theory posits that given positive costs of bankruptcy, firms are likely to reduce their use of debt when they face uncertainty about their earnings because debt is positively related to the chance of

¹ The effects of uncertainty on leverage with respect to profitability are justified as in Driver et al. (2005). According to standard investment models, firms decide their investments by equalizing risk-adjusted profitability and the marginal cost of borrowing. Since a firm's financing decisions are closely linked with its investment decisions, it is likely that uncertainty may affect the firm's investment and financing decisions through profitability as well.

² Examples of these studies, among several others, are Lee (2006), Mozumder and Marathe (2007), Gronwald (2008), Payne (2009), Ozturk et al. (2010), Narayan et al. (2011), and Naranpanawa and Bandara (2012).

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