



Why hedge? Rationales for corporate hedging and value implications

Kevin Aretz

Graduate School of Management, Lancaster University, Lancaster, UK

Söhnke M. Bartram

Management School, Lancaster University, Lancaster, UK, and

Gunter Dufey

*Ross Business School, University of Michigan, Ann Arbor, Michigan, USA and
Nanyang Business School, NTU Singapore, Singapore*

Abstract

Purpose – In the presence of capital market imperfections, risk management at the enterprise level is apt to increase the firm's value to shareholders by reducing costs associated with agency conflicts, external financing, financial distress, and taxes. The purpose of this paper is to provide an accessible and comprehensive account of these rationales for corporate risk management and to give a short overview of the empirical support found in the literature.

Design/methodology/approach – The paper outlines the main theories suggesting that corporate risk management can enhance shareholder value and briefly reviews the empirical evidence on these theories.

Findings – When there are imperfections in capital markets, corporate hedging can enhance shareholder value through its impact on agency costs, costly external financing, direct and indirect costs of bankruptcy, as well as taxes. More specifically, corporate hedging can alleviate underinvestment and asset substitution problems by reducing the volatility of cash flows, and it can accommodate the risk aversion of undiversified managers and increase the effectiveness of managerial incentive structures through eliminating unsystematic risk. Lower volatility of cash flows also leads to lower bankruptcy costs. Moreover, corporate hedging can also align the availability of internal resources with the need for investment funds, helping firms to avoid costly external financing. Finally, corporate risk management can reduce the corporate tax burden in the presence of convex tax schedules. While there is empirical support for these rationales of hedging at the firm level, the evidence is only modestly supportive, suggesting alternative explanations.

Originality/value – The discussed theories and the empirical evidence are described in an accessible way, in part by using numerical examples.

Keywords Corporate finances, Risk management, Foreign exchange

Paper type Research paper



1. Introduction

Nonfinancial firms increasingly employ risk management to shield their performance against financial risks, such as foreign exchange and interest rate risk, as several surveys indicate (e.g. Berkman *et al.*, 1997; Bodnar *et al.*, 1998). Corporate risk

Helpful comments and suggestions by an anonymous referee and seminar participants at the National University of Singapore are gratefully acknowledged.

management can be implemented in many ways, such as derivatives, foreign currency debt, operative hedging, etc. (Levi, 1996). While risk management at the firm level appears to lower the exposure of firms to exchange rate risk (Allayannis and Ofek, 2001), neo-classical finance theory seems to purport that corporate hedging cannot increase firm value, as explained below. Recent research, however, shows that in the presence of realistic capital market imperfections, i.e. agency costs, costs of external financing, direct and indirect bankruptcy costs, as well as taxes, corporate hedging will enhance shareholder value.

This paper provides a comprehensive and accessible overview of the existing positive rationales for corporate risk management in general and hedging in particular[1]. Specifically, it is discussed how corporate risk management can reduce agency conflicts such as underinvestment, asset substitution, or dysfunctional managerial behavior resulting from underdiversification or non-effective incentive structures. Moreover, external financing costs can be reduced through corporate hedging by aligning the availability of and need for investment funds. Finally, corporate hedging can lower the probability of future financial distress, thus enabling a firm to decrease its expected tax burden. Subsequent to the discussion of these rationales, a brief account of the empirical evidence is provided. There exists some empirical support for these theories, such as firms with high leverage being more likely to hedge. At the same time, there is also evidence that runs counter to theoretical predictions, such as larger and more profitable firms having a higher propensity to engage in hedging. Similarly, only some studies are able to find that firm value, as measured by Tobin's Q, is higher for firms that hedge.

The paper is structured as follows: Section 2 establishes the case for corporate hedging, while Section 3 introduces and explains the existing positive rationales for corporate risk management. Section 4 reviews the empirical evidence on these rationales, and, finally, the last section summarizes and concludes.

2. The case for value creation through corporate risk management

While it can be observed that corporations are frequently devoting intellectual and financial resources to financial risk management, it is by no means a trivial task to make a case for corporate risk management at the firm level. In particular, if parity relationships between prices of inputs, interest rates, and exchange rates hold, a change of one of these variables, potentially initiated through an external shock, will be rapidly offset by a related change in the other variables, thus reestablishing equilibrium. Furthermore, it could be argued that corporate hedging has no impact on firm value, as investors can achieve risk reduction at least as efficiently themselves through diversification or hedging. The hedging of risks that investors cannot diversify in financial markets (systematic risk) may also not increase shareholder value, as investors receive an appropriate return for holding securities of inherently risky businesses. Therefore, corporate hedging of market risks simply shifts firms along a line that reflects the risk/reward tradeoff in the market (Dufey and Srinivasulu, 1983).

However, on close inspection, it appears important to differentiate between the nature of the risks nonfinancial firms face, in particular between business risk and financial risk. Business risk is at the core of a firm's operations and arises from uncertainties with respect to product quality, input costs, technological factors,

changes in customer demand, etc. This risk is difficult and often impossible to hedge and indeed should not be hedged as nonfinancial firms typically have a competitive advantage in managing their business and the associated risks, while they generally do not have a competitive edge in managing financial risks, such as unexpected changes in exchange rates, interest rates, or commodity prices. As a result, it is economically sensible for nonfinancial firms to hedge their exposure to financial risks by “selling” them into the broader markets. Due to capital market imperfections – such as agency costs, costs of external financing, bankruptcy costs, and taxes – corporate hedging by nonfinancial corporations can increase their firm value, as discussed in the following section.

3. Rationales for corporate risk management

3.1 *Mitigating the underinvestment problem*

In a world of imperfect contracts, the interests of a firm’s stakeholders, such as managers, shareholders, bondholders, and employees, might be incongruent, especially when the firm is highly leveraged and when information asymmetries exist. In particular, firms with risky debt outstanding and low firm value may not exhibit optimal investment behavior. This stems from the fact that, if fixed payment obligations are high, rational managers may choose not to invest even in positive Net-Present-Value projects, as the realization of such investments primarily benefits bondholders (Myers, 1977; Smith *et al.*, 1990).

This underinvestment problem can be alleviated by rewriting or renegotiating debt contracts, shortening the maturity of outstanding debt, or issuing less debt, but these remedies create additional costs. Corporate hedging can reduce the risk of investment projects – smaller range of possible outcomes over all states of the world – and makes it therefore less likely that the firm finds itself in situations in which the underinvestment problem occurs (Mayers and Smith, 1987; Smith *et al.*, 1990; Bessembinder, 1991; Smith, 1995). Assume a firm has only one asset which is a positive NPV project. There are two equally-likely future states of nature: In the first state, the project translates into a firm value of \$100 million; in the second, into a value of \$200 million. The decision to accept or reject the project is undertaken after the state of nature is revealed. Fixed obligations amount to \$125 million. If the first state of nature occurs, shareholders will rationally decide to reject the project, as they have to raise the required investment outlay, while all benefits accrue to bondholders. The initial outlay is thus an avoidable loss.

In Figure 1, the numerical example is shown in a more realistic setting with infinite states of nature. In the absence of agency conflicts, it would be optimal for a firm to invest in a project, whenever the gains from the project exceed the initial outlay (this occurs, when $S > S_0$). However, in the presence of agency costs, managers acting in the best interest of shareholders invest only when gains from the project exceed the initial outlay plus fixed payment obligations ($S > S_1$). This implies that underinvestment occurs in the region between S_0 and S_1 . Now assume the firm succeeds in stabilizing its cash flows through hedging and thereby ensures that the gains from the project are less often below initial investment plus fixed obligations. In terms of the example, the firm would fix its future company value at \$150 million, ensuring that positive NPV projects are always accepted and firm value is increased (Smith, 1995).

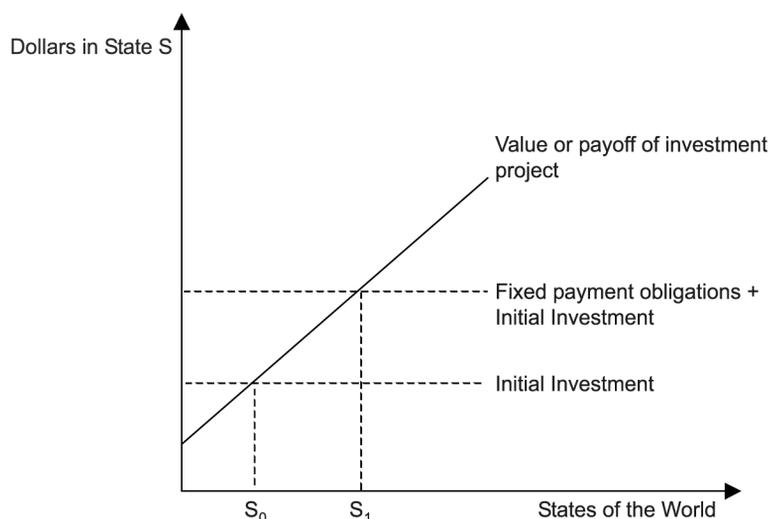


Figure 1.
The underinvestment problem

3.2 Reducing the asset substitution problem

Managers acting on behalf of shareholders have incentives to shift towards riskier investment projects, especially when debt levels are high and firm value is low, since shareholders mainly receive the benefits of positive stock price movements while bondholders suffer the consequences of negative stock price movements. This arises as shareholders have a call option-like claim on the firm's assets (e.g. Merton, 1974; Mason and Merton, 1985). Bondholders, however, anticipate this opportunistic behavior, and protect themselves against the expected losses by demanding higher returns, or by designing debt covenants accordingly (Smith and Warner, 1979). Corporate risk management may prevent firm value from dropping off to levels at which there are strong incentives to increase risk – which is normally at low firm value, where the wealth transfer from bondholders to shareholders is largest (Campbell and Kracaw, 1990; Smith, 1995).

Assume a firm has a value of \$500 million and fixed obligations of \$600 million. If value remains constant, the firm goes bankrupt and shareholders receive nothing. If, however, shareholders can raise the firm's risk so that it now faces two potential future values, e.g. \$700 and \$200 million, with equal probabilities, this strategy benefits them, as they now have a chance of earning \$100 million. This strategy, however, reduces firm value to \$450 million. Imagine that corporate hedging can prevent firm value from dropping below \$600 million in the first place. In this case, there would be reduced incentives to increase risk. As a result, corporate hedging can alleviate agency costs, such as higher debt yields or binding protective covenants (Stulz, 2002; Chidambaram *et al.*, 2001).

3.3 Undiversified managers

Additional conflicts resulting from the principle-agent relationship between shareholders and managers might emerge, as shareholders can usually diversify away the idiosyncratic risk of their positions, whereas for managers this is often difficult at the personal level. In particular, the difficulty to diversify away

idiosyncratic risk arises through the tied relationship between managers and the firm, which is manifested in managers' proportion of wealth invested in the firm, years worked for the firm, specific asset expertise, reputation, etc. (May, 1995). As a result, some managerial decisions – such as the engagement in conglomerate mergers or suboptimal debt levels – benefit managers, as they lower the risk attached to their wealth positions, while they are not beneficial to shareholders (Berger and Ofek, 1995; Comment and Jarrell, 1995; Bodnar *et al.*, 1997). Agency costs arise in this situation through shareholders' efforts to reduce non-maximizing behavior, e.g. through close monitoring (e.g. Mayers and Smith, 1982; 1990; Stulz, 1984; 1990; Fite and Pfleiderer, 1995).

Corporate risk management can reduce these agency costs, as it lowers the risk of profitable growth opportunities (and of the variability in firm value) and thus accommodates the risk aversion of undiversified managers who have now fewer incentives to engage in non-value maximizing management decisions arising through differences in risk preferences (Stulz, 2002). Next, since corporate hedging reduces the risk of managers' human capital, the risk premium component of management compensation might be reduced as well (DeMarzo and Duffie, 1995).

3.4 Management incentives structures

Another means to align managers' and shareholders' interests consists of management compensation schemes, which tie the remuneration of upper-management to various measures of corporate performance such as earnings or stock price movements. Stock price-related compensation schemes may consist of company stock or stock option programs. If a part of management remuneration is linked directly to the stock price of the company, stock price movements immediately affect management compensation one to one, hereby intensifying the risk aversion of undiversified managers. In contrast, if management remuneration has option features, the relationship is convex with the incremental benefit of a change in stock price depending on the level of the stock price. As a result, strong incentives are created for managers to reduce their risk aversion and to boost the stock price (Bartram, 2000).

As not all determinants of the share price are under managers' control (e.g. exchange rate or interest rate risk are clearly beyond management control), the stock price of a firm may not be a good indicator of management performance in the absence of corporate hedging. As a result, due to the influence of risks unrelated to management performance on share price, management compensation plans are rendered less effective, as they occasionally reward poorly performing and punish well-performing managers. Corporate risk management, however, can reduce the impact of unrelated financial risks on firm value and thus strengthen the relationship between stock price and management performance. At the same time, it may also become easier to distinguish between efficient and inefficient managers (Campbell and Kracaw, 1987; Stulz, 2002).

3.5 Harmonizing financing and investment policies

Since corporate cash flows vary over time, firms may face cash surpluses or shortages relative to their planned investment projects if cash flows and investment expenditures are not perfectly correlated. As a result, without corporate hedging, firms might have to bear costs in terms of either forgone positive NPV projects or costs of external

financing. Costs of external debt and equity financing arise in imperfect capital markets through various transaction and agency costs, leading to increasing marginal financing costs. In particular, in case of external debt, creditors might demand higher yields on the capital provided when the issuance of additional debt leads to a higher probability of bankruptcy and financial distress, or might insist on restrictive debt covenants, which are also costly, as they limit the managerial degrees of freedom with regard to future financing and investment decisions (Myers, 1984; 1993). Due to asymmetric information, potential investors may view equity offerings as a signal that the share price is overvalued. As an empirical result, equity offerings normally cause a firm's stock price to decline significantly (Asquith and Mullins, 1986).

Therefore, if internal corporate cash flows are not sufficient to finance all profitable investment projects, firm value is not maximized due to opportunity costs caused by the rejection of some value-enhancing investment projects or the cost associated with external financing. Assume a firm has a constant demand for investment funds of \$500 million. This firm expects an internal cash flow of \$700 million under favorable business conditions, and of \$300 million under unfavorable conditions. Thus, in the former case, the firm lacks \$200 million to finance its investment projects, while in the latter case it faces a surplus of the same magnitude. If the firm could now enter into a financial contract that shifted the surplus from the favorable to the unfavorable state of nature, then it would have hedged its investment plan.

In Figure 2(a), the difference between the demand for investment funds and the supply of internal cash flows equals the gap between the two lines. In this case, corporate risk management can align internal corporate cash flows and investment expenditures by reducing the cash flow surplus when cash flows exceed investment expenditures (arrow pointing downwards) and providing cash when cash flows are below investment expenditures (arrow pointing upwards) (Lewent and Kearney, 1990; Froot *et al.*, 1993; 1994; Santomero, 1995; Copeland and Copeland, 1999; Mello and Parsons, 1999; 2000; Minton and Schrand, 1999; Moore *et al.*, 2000; Chidambaram *et al.*, 2001).

However, it may not be necessary for firms to completely hedge financial risks, if – even in the absence of corporate hedging – the availability of their internal cash flows tends to match the need for investment funds. In terms of the example, this could, e.g. imply that the firm's demand for funds equals \$600 and \$400 million under favorable and unfavorable business conditions, respectively. This is shown in Figure 2(b), in which the availability of corporate cash flows partially matches the need for investment funds, i.e. in this scenario, the line is not flat. An oil company, for example, might find it less attractive to explore new oil reserves when the market price of oil is low. On the other hand, if the oil price rises, the value of investing rises and so will the internal cash flows (Froot *et al.*, 1994).

An important caveat to this discussion is that the costs of external financing are often seen as a form of market discipline, which prevents inefficient firms from attracting capital. As a consequence, corporate hedging may actually reduce this form of market discipline and, as a result, might lead to losses from a social welfare point of view (Chang, 1997; Tufano, 1998).

3.6 Reducing bankruptcy and financial distress costs

While higher leverage increases firm value through the tax advantage of debt, it also puts pressure on the firm, as the interest rate and principal payments of debt constitute

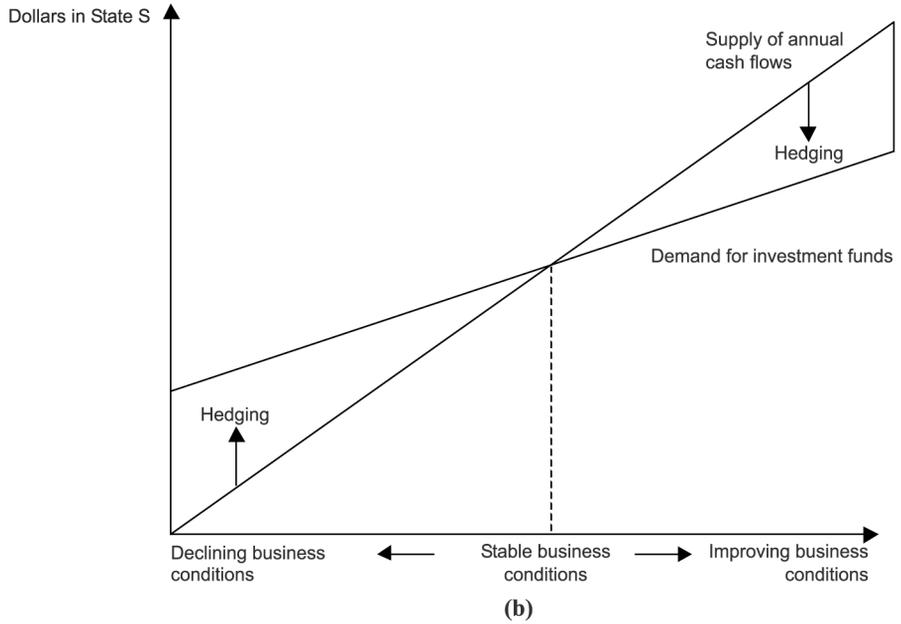
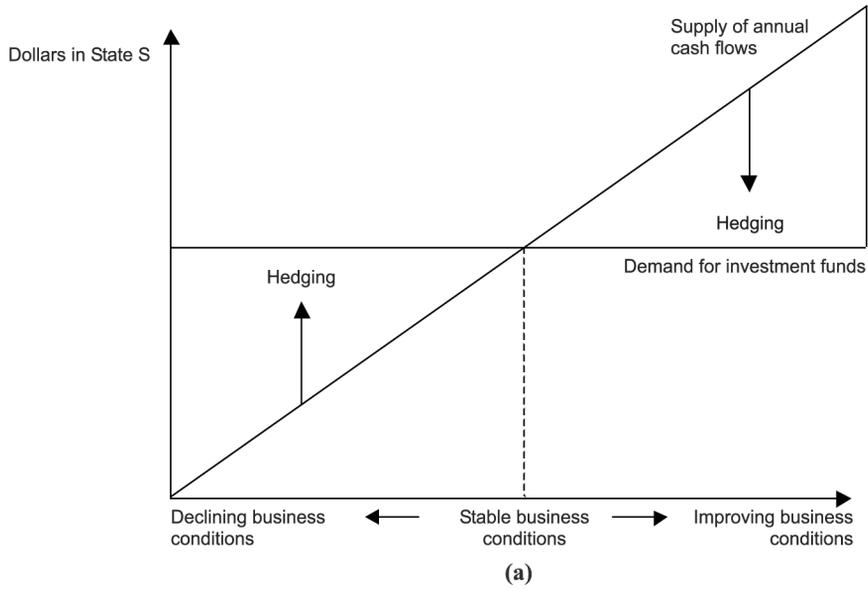


Figure 2.
Coordinating financing
and investment policies

obligations to which bondholders are legally entitled. Similar to bondholders, employees are also legally entitled to their wages. As a result, if these obligations are not met fully and in a timely manner, the firm may encounter financial distress and, ultimately, bankruptcy. In a perfect capital market world, bankruptcy leads to a costless renegotiation of the firm's assets, which normally ends in a transfer of assets from stockholders to bondholders. In reality, however, bankruptcy – and also the probability of future bankruptcy – creates substantial costs for the firm which have a negative impact on firm value (Smith and Stulz, 1985).

These costs have two components: direct and indirect costs of financial distress. Direct costs of financial distress are related to the costs incurred in the bankruptcy proceeding, such as fees for lawyers, expert witnesses, and administrative and accounting fees. While these direct costs appear huge in absolute terms, they are usually only 1-3 percent of total firm value (Warner, 1977; Weiss, 1990). Expected direct costs of financial distress years before bankruptcy are even much lower.

Other financial distress costs – not directly related to the bankruptcy proceeding – arise as soon as stakeholders perceive that there is a realistic chance of bankruptcy in the future. These indirect costs are caused by the reluctance to deal with the company, as both suppliers and customers cannot be ensured that unsettled credits will be honored, warranties fulfilled, spare parts available, etc. Moreover, the possibility of bankruptcy entails a distraction of management and leads to a risk premium reflected in management and employee compensation (or the loss of human capital). By the same token, firms in bad financial conditions often have a high employee turnover, resulting in increased costs for searching for and training employees. The existing empirical evidence suggests that the indirect costs are substantially larger than the direct costs, since they can reach 20 percent of firm value (Cutler and Summers, 1989).

The expected costs of financial distress, which are the product of the probability and costs, increase with leverage and volatility of cash flows, as both factors increase the probability of winding up in bankruptcy in the future. This implies that the present value of cash flows to the claimholders of a firm decreases with volatility and leverage, reducing firm value. As a result, corporate risk management can increase the value of the firm by reducing the volatility of cash flows and thus of firm value (Mayers and Smith, 1982; Smith and Stulz, 1985; Rawls and Smithson, 1990; Dolde, 1993; Santomero, 1995; Stulz, 1996; 2002; Raposo, 1999).

Suppose an extremely distressed firm has a 60 percent chance of being unable to repay its fixed obligations. Due to this strictly positive chance of bankruptcy, the firm incurs indirect costs of financial distress, the discounted value of which equals \$88 million. Additionally, if the firm defaults, it would also face direct costs of financial distress, whose discounted value sums up to \$20 million. Conditional on a default risk of 60 percent, the expected direct bankruptcy costs are \$12 million (60 percent * \$20 million). As a result, the firm incurs a total loss of \$100 million in the present because of the mere probability of bankruptcy in the future. Assume now that this firm hedges its cash flows and thus decreases its default risk to 20 percent. As the probability of bankruptcy decreases, so does the reluctance of customers, suppliers, and potential employees to engage in business with this company, bringing the indirect cost of financial distress down to, e.g. \$56 million. Similarly, the expected discounted value of direct bankruptcy costs also comes down to \$4 million (20 percent * \$20 million). The

total loss in firm value of \$60 million in case of corporate hedging is markedly below the former value of \$100 million.

Figure 3 shows the distribution of cash flows of a firm which is unable to pay off its bondholders and employees when cash flows drop below fixed payment obligations (marked as FPO). As the probability of falling below this point is positive, the firm incurs bankruptcy costs. If corporate risk management stabilizes firm value and ensures that cash flows are below FPO in fewer states of nature, firm value increases from $E_1(V)$ to $E_2(V)$. In addition to this effect, corporate risk management enables a firm to increase its optimal debt-equity ratio due to the lower volatility of future cash flows and thus to enjoy greater tax benefits, hereby enhancing firm value beyond the reduction in financial distress costs (Ross, 1997; Leland, 1998; Graham and Rogers, 2002).

3.7 Reducing the corporate tax burden

When firms face tax regimes where a higher tax rate applies as income increases (convex schedule), they can lower their tax burden through corporate hedging by reducing the volatility of pre-tax income (Graham and Smith, 1999). Consider a firm with a marginal tax rate of 20 percent for the first \$50 million in taxable income and 40 percent for anything above. This firm earns \$40 million in one year and \$60 million in the subsequent year. In the first year, the firm pays taxes of \$8 million (20 percent * \$40), and, in the second year, taxes amount to \$14 million (20 percent * \$50 + 40 percent * \$10). The average tax burden is thus \$11 million. If this firm fixes its taxable income at \$50 million per year by using corporate hedging, its average tax burden will be \$10 million (20 percent * \$50). This documents the value-enhancing impact of corporate risk management (Kale and Noe, 1990; Mayers and Smith, 1990; Smith *et al.*, 1990; Santomero, 1995; Smith, 1995; Graham and Smith, 1999; Bartram, 2002).

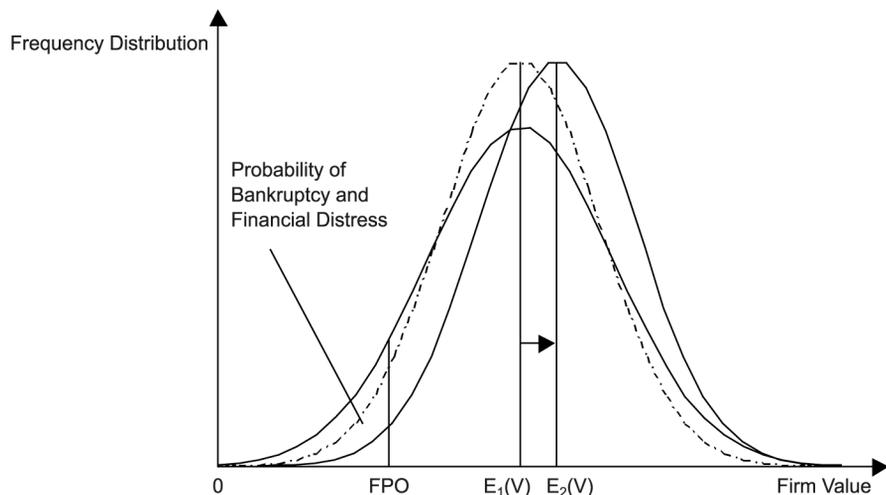


Figure 3.
Bankruptcy and financial
distress

FPO: Level of fixed payment obligations.
 $E_1(V)$: Expected firm value without corporate hedging.
 $E_2(V)$: Expected firm value with corporate hedging.

Figure 4 illustrates this example. The two pre-tax income levels in year one and two are labeled as PTI_1 and PTI_2 . In contrast, PTI_3 is the pre-tax income if the firm decides to hedge. The graph shows that – if the tax schedule is convex - the firm incurs a higher expected tax burden in the case of volatile pre-tax income than in case of stable pre-tax income. Note that the focus here is on taxable income and not on cash flows (Smith and Stulz, 1985).

The convexity of tax schedules can not only be caused by marginal tax rates increasing progressively with taxable income (as illustrated in the former example) (Mayers and Smith, 1990), but additionally by limitations of special tax preference items, e.g. the inability to carry losses forward or backward for an unlimited number of years. Thus, in case of low income or losses, firms may be unable to completely exploit the benefits of these provisions (Stulz, 2002).

4. Empirical evidence on corporate hedging rationales

The presented rationales for corporate risk management have been subject to ample empirical investigation, including studies by Nance *et al.* (1993), Dolde (1995), Tufano (1996), Géczy *et al.* (1997), Haushalter (2000), and Graham and Rogers (2002). In particular, most empirical studies test for the underinvestment and the asset substitution rationales by studying firms' growth opportunities, as firms with many growth opportunities should have a high probability of underinvestment or asset substitution. As a result, it can be hypothesized that these firms should be more inclined to hedge than firms with less growth opportunities. In general, empirical evidence often supports this hypothesis (e.g. Fok *et al.*, 1997; Graham and Rogers, 2002).

Moreover, agency conflicts between managers and shareholders are often studied by reviewing managerial incentive structures, such as stock or stock option programs. While managers in possession of stock option programs should have incentives to avoid hedging, as corporate risk management decreases firm value volatility and thus the value of their options, managerial stock programs should motivate managers to hedge. Empirical support for these hypotheses is mixed (e.g. Haushalter, 2000; Graham and Rogers, 2002). Evidence from the North American gold mining industry indicates

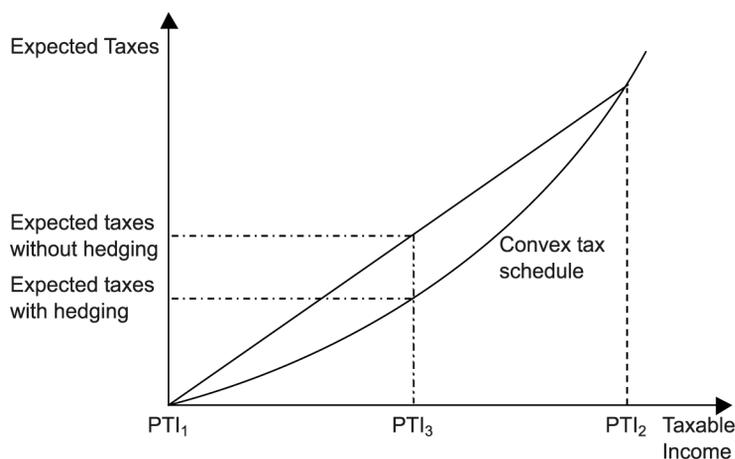


Figure 4.
Taxes

that firms whose managers hold more options (stock) manage less (more) gold price risk, suggesting that managerial risk aversion may affect corporate risk management policy (Tufano, 1996).

The coordinating investment and financing rationale is frequently tested along the same lines as the underinvestment or the asset substitution hypotheses, as it also crucially depends on available growth opportunities (firms with no growth opportunities never run the risk that their internal cash flow is insufficient to finance all positive investment projects). Moreover, it can be studied whether firms that employ corporate risk management have a lower sensitivity of investment to pre-hedging cash flows (Allayannis and Mozumdar, 2000). There exists some empirical evidence for this rationale.

In order to test the bankruptcy and financial distress rationale, empirical studies mainly focus on firms' leverage and profitability, as firms with high leverage and low profitability are more likely to encounter financial distress in the future and should thus have stronger incentives to hedge. While financial leverage is often statistically significant, empirical results on the profitability of hedging firms are typically insignificant. Nonetheless, empirical studies lend some support for this argument (e.g. Haushalter, 2000; Graham and Rogers, 2002).

Empirical studies find little support for the tax argument, which is often tested by observing the availability of tax-loss carry-forwards or by calculating potential tax savings from corporate risk management (e.g. Gay and Nam, 1998; Graham and Rogers, 2002). Possible reasons are that the incentive to hedge for tax purposes is small compared to other incentives.

An alternative to testing whether firms for which theory suggests that they have large incentives to hedge employ corporate risk management more frequently than firms with low incentives is to directly test for the impact of corporate hedging on firm value, often measured by Tobin's Q . The empirical evidence provides some support for an increase in shareholder wealth through corporate risk management, for instance, by approximately 4 percent for a large sample of US firms with exchange rate exposure (Allayannis and Weston, 2001) and 12-16 percent for a sample of firms belonging to the US airline industry (Carter *et al.*, 2003). Moreover, there is some evidence that the value impact of corporate risk management might depend on corporate governance structures, i.e. there seems to be a positive value impact only in countries with strong corporate governance (Allayannis *et al.*, 2004). Bartram *et al.* (2006) study a global sample of 6,896 non-financial firms from 47 countries. Controlling for endogeneity using several different techniques, they find strong evidence that the use of financial derivatives reduces firm risk as well as some evidence that derivative use is related to higher firm value as measured by Tobin's Q . In contrast, other studies either find insignificant value effects, or even that corporate hedging decreases firm value (Nguyen and Faff, 2003).

Nevertheless, these tests are potentially plagued by challenges of correctly specifying the empirical tests. To illustrate, it might be the case that the supportive evidence in previous studies is driven by the fact that derivatives' usage proxies for other firm attributes which are known to affect shareholder wealth (Lookman, 2003). Again, there is additional evidence from more detailed data available for commodity-based industries. In particular, a recent study investigates the hedging activities of 119 US oil and gas producers from 1998 to 2001 and evaluates their effect on firm value, based on detailed information on the extent of hedging and on the

valuation of oil and gas reserves (Jin and Jorion, 2006). While hedging reduces the firms' stock price sensitivity to oil and gas prices, hedging does not seem to affect the market value of firms in this industry.

Related work suggests an effect of corporate risk management on firm value not due to capital market imperfections, if revenues are concave in product prices or if costs are convex in factor prices (Mackay and Moeller, 2006). The corresponding empirical evidence, based on 34 oil refiners, suggests that hedging concave revenues and leaving concave costs exposed each represent between 2 percent and 3 percent of firm value. Similarly, there is some evidence that firms in the gold mining industry have consistently realized economically significant cash flow gains from their derivatives transactions without an offsetting adjustment in firms' systematic risk, suggesting that derivatives transactions have positive NPV for these firms (Adam and Fernando, 2006). The evidence of studies directly analyzing the value impact of corporate hedging is thus fairly mixed and inconclusive to date as well, suggesting the need for further empirical, and possibly theoretical, analysis on this issue.

5. Summary and conclusion

In the presence of capital market imperfections, which consist of agency costs, transaction costs, such as bankruptcy and financial distress costs, and taxes, corporate risk management constitutes a means to enhance shareholder value. In particular, hedging at the firm level may reduce agency conflicts between shareholders and bondholders, such as the incentive to invest below optimal levels or the incentive to increase the riskiness of the assets. Also, agency conflicts between shareholders and managers due to different risk preferences can be alleviated via corporate risk management.

Moreover, corporate hedging may increase firm value by reducing various transaction costs. By reducing cash flow volatility, firms face a lower probability of default and thus have to bear lower expected costs of bankruptcy and financial distress. A lower probability of default enables firms at the same time to increase their leverage and therefore to benefit from greater tax shields. Risk management at the firm level can also help to align the availability of internal cash flows and the need for funds for corporate investment. As a result, the costs of external financing or the opportunity costs of forgoing profitable investment projects when internal funds are not sufficient to finance all profitable growth opportunities are reduced.

Finally, corporate risk management can reduce fluctuations in pre-tax income and thus lower the tax burden of firms if corporate income is subject to a convex tax schedule. The convexity of tax schedules result from progressively increasing marginal tax rates or limitations of various special tax preference items.

While there is some empirical support for these rationales of hedging at the firm level, the evidence is overall somewhat mixed. Consequently, future research might explore issues such as considering derivatives usage being just one part of a broader financial strategy of the firm. In particular, recent evidence suggests that the use of derivatives influences debt levels and maturity, dividend policy, holdings of liquid assets, and the degree of operating hedging, and that financial derivatives only have a small impact on the risk profile of firms, while corporations rely more heavily on pass-through, operational hedging, and foreign currency debt to manage financial risk. At the same time, it appears to be important to consider and control for endogeneity problems when assessing the impact of corporate hedging on firm value.

Note

1. We will use the terms risk management and hedging as synonyms in this paper. Note, however, that in principle risk management is a broader concept involving an analysis of enterprise risk and including the identification of relevant risk factors for a specific firm and a decision whether to manage, insure, or hedge risks. Hedging, in contrast, is more specific and involves a deliberate action to reduce or eliminate certain risks using asset/liability management (e.g. debt denomination), financial and commodity derivatives, and operational measures.

References

- Adam, T. and Fernando, C.S. (2006), "Hedging, speculation and shareholder value", *Journal of Financial Economics*.
- Allayannis, G. and Mozumdar, A. (2000), "Cash flow, investment, and hedging", working paper, University of Virginia, Charlottesville, VA.
- Allayannis, G. and Ofek, E. (2001), "Exchange rate exposure, hedging, and the use of foreign currency derivatives", *Journal of International Money and Finance*, Vol. 20, pp. 273-96.
- Allayannis, G. and Weston, J.P. (2001), "The use of foreign currency derivatives and firm market value", *Review of Financial Studies*, Vol. 14 No. 1, pp. 243-76.
- Allayannis, G., LeI, U. and Miller, D. (2004), "Corporate governance and the hedging premium around the world", working paper, Darden School University of Virginia, Charlottesville, VA.
- Asquith, P. and Mullins, D.W. Jr (1986), "Equity issues and offering dilution", *Journal of Financial Economics*, Vol. 15, pp. 61-89.
- Bartram, S.M. (2000), "Corporate risk management as a lever for shareholder value creation", *Financial Markets, Institutions, and Instruments*, Vol. 9 No. 5, pp. 279-324.
- Bartram, S.M. (2002), "Enhancing shareholder value with corporate risk management", *Corporate Finance Review*, Vol. 7 No. 3, pp. 7-12.
- Bartram, S.M., Brown, G.W. and Conrad, J. (2006), "The effects of derivatives on firm risk and value", working paper, Lancaster University, Lancaster and University of North Carolina at Chapel Hill, Chapel Hill, NC.
- Berger, P.G. and Ofek, E. (1995), "Diversification's effect on firm value", *Journal of Financial Economics*, Vol. 37 No. 1, pp. 39-65.
- Berkman, H., Bradbury, M.E. and Magan, S. (1997), "An international comparison of derivative use", *Financial Management*, Vol. 26 No. 4, pp. 69-73.
- Bessembinder, H. (1991), "Forward contracts and firm value: investment incentive and contracting effects", *Journal of Financial and Quantitative Analysis*, Vol. 26 No. 4, pp. 519-32.
- Bodnar, G.M., Hayt, G.S. and Marston, R.C. (1998), "1998 Wharton Survey of financial risk management by US non-financial firms", *Financial Management*, Vol. 27 No. 4, pp. 70-91.
- Bodnar, G.M., Tang, C. and Weintrop, J. (1997), "Both sides of corporate diversification: the value impacts of geographic and industrial diversification", NBER Working Paper Series, NBER, Cambridge, MA.
- Campbell, T.S. and Kracaw, W.A. (1987), "Optimal managerial contracts and the value of corporate insurance", *Journal of Financial and Quantitative Analysis*, Vol. 22 No. 3, pp. 315-28.
- Campbell, T.S. and Kracaw, W.A. (1990), "Corporate risk management and incentive effects of debt", *Journal of Finance*, Vol. 45 No. 5, pp. 1673-86.

-
- Carter, D.A., Rogers, D. and Simkins, B.J. (2003), "Does fuel hedging make economic sense? The case of the U.S. airline industry", working paper, Oklahoma University, Norman, OK.
- Chang, C. (1997), "Does corporate hedging aggravate or alleviate agency problems. A managerial theory of risk management", working paper, University of Minnesota, Minneapolis, MN.
- Chidambaran, N.K., Fernando, C.F. and Spindt, P.A. (2001), "Credit enhancement through financial engineering: Freeport McMoRan's gold-denominated depository shares", *Journal of Financial Economics*, Vol. 60, pp. 487-528.
- Comment, R. and Jarrell, G.A. (1995), "Corporate focus and stock returns", *Journal of Financial Economics*, Vol. 37 No. 1, pp. 67-87.
- Copeland, T. and Copeland, M. (1999), "Managing corporate FX risk: a value maximizing approach", *Financial Management*, Vol. 28 No. 3, pp. 68-75.
- Cutler, D. and Summers, L. (1989), "The cost of conflict resolution and financial distress: evidence from the Texaco-Pennzoil litigation", *Lawrence H. Rand Journal of Economics*, Vol. 19 No. 2, pp. 157-72.
- DeMarzo, P.M. and Duffie, D. (1995), "Corporate incentives for hedge and hedge accounting", *Review of Financial Studies*, Vol. 8 No. 3, pp. 743-71.
- Dolde, W. (1993), "The trajectory of corporate financial risk management", *Continental Bank Journal of Applied Corporate Finance*, Vol. 6 No. 3, pp. 33-41.
- Dolde, W. (1995), "Hedging, leverage and primitive risk", *Journal of Financial Engineering*, Vol. 4 No. 2, pp. 187-216.
- Dufey, G. and Giddy, I.H. (1997), "Management of corporate foreign exchange risk", in Choi, F.D.S. (Ed.), *International Accounting and Finance Handbook*, 2nd ed., Chapter 31, Wiley, New York, NY.
- Dufey, G. and Srinivasulu, S.L. (1983), "The case for corporate management of foreign exchange risk", *Financial Management*, Vol. 12 No. 4, pp. 54-62.
- Fite, D. and Pfliegerer, P. (1995), "Should firms use derivatives to manage risk?", in Beaver, W. and Parker, G. (Eds), *Risk Management: Problems and Solutions*, McGraw-Hill, New York, NY, pp. 139-69.
- Fok, R.C.W., Carroll, C. and Chiou, M.C. (1997), "Determinants of corporate hedging and derivatives: a revisit", *Journal of Economics and Business*, Vol. 49, pp. 569-85.
- Froot, K.A., Scharfstein, D.S. and Stein, J.C. (1993), "Risk management: coordinating corporate investment and financing policies", *Journal of Finance*, Vol. 48 No. 5, pp. 1629-58.
- Froot, K.A., Scharfstein, D.S. and Stein, J.C. (1994), "A framework for risk management", *Harvard Business Review*, Vol. 72 No. 6, pp. 91-102.
- Gay, G.D. and Nam, J. (1998), "The underinvestment problem and corporate derivatives use", *Financial Management*, Vol. 27 No. 4, pp. 53-69.
- Géczy, C., Minton, B.A. and Schrand, C. (1997), "Why firms use currency derivatives", *Journal of Finance*, Vol. 52 No. 4, pp. 1323-54.
- Graham, J.R. and Rogers, D.A. (2002), "Is corporate hedging consistent with value maximization? An empirical analysis", *Journal of Finance*, Vol. 57 No. 2, pp. 815-40.
- Graham, J.R. and Smith, C.W. Jr (1999), "Tax incentives to hedge", *Journal of Finance*, Vol. 54 No. 6, pp. 2241-63.
- Guay, W.R. and Kothari, P. (2003), "How much do firms hedge with derivatives?", *Journal of Financial Economics*, Vol. 70, pp. 423-61.
- Haushalter, G.D. (2000), "Financing policy, basis risk, and corporate hedging: evidence from oil and gas producers", *Journal of Finance*, Vol. 55 No. 1, pp. 107-52.

-
- Jin, Y. and Jorion, P. (2006), "Firm value and hedging: evidence from US oil and gas producers", *Journal of Finance*.
- Kale, J.R. and Noe, T.H. (1990), "Corporate hedging under personal and corporate taxation", *Managerial and Decision Economics*, Vol. 11 No. 3, pp. 199-205.
- Kedia, S. and Mozumdar, A. (2003), "Foreign currency denominated debt: an empirical examination", *Journal of Business*, Vol. 76, pp. 521-46.
- Leland, H.E. (1998), "Agency costs, risk management, and capital structure", *Journal of Finance*, Vol. 53 No. 4, pp. 1213-43.
- Levi, M.D. (1996), *International Finance*, McGraw-Hill, New York, NY.
- Lewent, J.C. and Kearney, A.J. (1990), "Identifying, measuring, and hedging currency risk at Merck", *Continental Bank Journal of Applied Corporate Finance*, Vol. 2 No. 4, pp. 19-28.
- Lookman, A. (2003), "Does hedging really affect firm value?", working paper, Carnegie Mellon University, Pittsburgh, PA.
- Mackay, P. and Moeller, S.B. (2006), "Moeller The value of corporate risk management", *Journal of Finance*, forthcoming.
- Mason, S.P. and Merton, R.C. (1985), "The role of contingent claims analysis in corporate finance", in Altman, E.I. and Subrahmanyam, M.G. (Eds), *Recent Advances in Corporate Finance*, Irwin, Homewood, IL, pp. 7-54.
- May, D.O. (1995), "Do managerial motives influence firm risk reduction strategies?", *Journal of Finance*, Vol. 50 No. 4, pp. 1291-308.
- Mayers, D. and Smith, J.r.C.W. (1982), "On the corporate demand for insurance", *Journal of Business*, Vol. 55 No. 2, pp. 281-96.
- Mayers, D. and Smith, J.r.C.W. (1987), "Corporate insurance and the underinvestment problem", *Journal of Risk and Insurance*, Vol. 54 No. 1, pp. 45-54.
- Mayers, D. and Smith, J.r.C.W. (1990), "On the corporate demand for insurance: evidence from the reinsurance market", *Journal of Business*, Vol. 63 No. 1, pp. 19-40.
- Mello, A.S. and Parsons, J.E. (1999), "Strategic hedging", *Journal of Applied Corporate Finance*, Vol. 12 No. 3, pp. 43-54.
- Mello, A.S. and Parsons, J.E. (2000), "Hedging and liquidity", *Review of Financial Studies*, Vol. 13, pp. 127-53.
- Merton, R.C. (1974), "On the pricing of corporate debt: the risk structure of interest rates", *Journal of Finance*, Vol. 29, pp. 449-70.
- Minton, B.A. and Schrand, C.M. (1999), "The impact of cash flow volatility of discretionary investment and the costs of debt and equity financing", *Journal of Financial Economics*, Vol. 54 No. 3, pp. 423-61.
- Moore, J., Culver, J. and Masterman, B. (2000), "Risk management for middle market companies", *Journal of Applied Corporate Finance*, Vol. 12 No. 4, pp. 112-9.
- Myers, S.C. (1977), "Determinants of corporate borrowing", *Journal of Financial Economics*, Vol. 5, pp. 147-75.
- Myers, S.C. (1984), "The capital structure puzzle", *Journal of Finance*, Vol. 39 No. 3, pp. 575-92.
- Myers, S.C. (1993), "Still searching for optimal capital structure", in Stern, J.M. and Chew, D.H. (Eds), *The Revolution in Corporate Finance*, Basil Blackwell, New York, NY, pp. 91-9.
- Nance, D.R., Smith, C.W. Jr and Smithson, C.W. (1993), "On the determinants of corporate hedging", *Journal of Finance*, Vol. 48 No. 1, pp. 267-84.

-
- Nguyen, H. and Faff, R. (2003), "Are financial derivatives really value-enhancing? Australian evidence", working paper, University of South Australia, Adelaide.
- Raposo, C.C. (1999), "Corporate hedging: what have we learnt so far?", *Derivatives Quarterly*, Vol. 5 No. 3, pp. 41-51.
- Rawls, S.W. and Smithson, C.W. (1990), "Strategic risk management", *Journal of Applied Corporate Finance*, Vol. 2 No. 4, pp. 6-18.
- Ross, M.P. (1997), "Corporate hedging: what, why, and how?", working paper, University of California Berkeley, Berkeley, CA.
- Santomero, A.M. (1995), "Financial risk management: the whys and hows", *Financial Markets, Institutions & Instruments*, Vol. 4 No. 5, pp. 1-14.
- Smith, C.W. Jr (1995), "Corporate risk management: theory and practice", *Journal of Derivatives*, Vol. 2 No. 4, pp. 21-30.
- Smith, C.W. Jr and Stulz, R.M. (1985), "The determinants of firms' hedging policies", *Journal of Financial and Quantitative Analysis*, Vol. 20 No. 4, pp. 391-405.
- Smith, Jr.C.W. and Warner, J.B. (1979), "On financial contracting: an analysis of bond contracting", *Journal of Financial Economics*, Vol. 7 No. 2, pp. 117-61.
- Smith, C.W. Jr, Smithson, C.W. and Wilford, D.S. (1990), "Financial engineering: why hedge?", in Smith, C.W. Jr and Smithson, C.W. (Eds), *The Handbook of Financial Engineering*, Harper Business Books, Grand Rapids, MI, pp. 126-37.
- Stulz, R.M. (1984), "Optimal hedging policies", *Journal of Financial and Quantitative Analysis*, Vol. 19 No. 2, pp. 127-40.
- Stulz, R.M. (1990), "Managerial discretion and optimal hedging policy", *Journal of Financial Economics*, Vol. 26 No. 1, pp. 3-27.
- Stulz, R.M. (1996), "Rethinking risk management", *Journal of Applied Corporate Finance*, Vol. 9 No. 3, pp. 8-24.
- Stulz, R.M. (2002), "Creating value with risk management", in Stulz, R.M. (Ed.), *Derivatives, Risk Management and Financial Engineering*, (Chapter 3), Southwestern College Publishing, Cincinnati, OH.
- Tufano, P. (1996), "Who manages risk? An empirical examination of the risk management practices in the gold mining industry", *Journal of Finance*, Vol. 51 No. 4, pp. 1097-137.
- Tufano, P. (1998), "Agency costs of corporate risk management", *Financial Management*, Vol. 27 No. 1, pp. 67-77.
- Warner, J.B. (1977), "Bankruptcy costs: some evidence", *Journal of Finance*, Vol. 32 No. 2, pp. 337-47.
- Weiss, L.A. (1990), "Bankruptcy resolution: direct costs and violation of priority claims", *Journal of Financial Economics*, Vol. 27 No. 2, pp. 285-314.

Corresponding author

Söhnke M. Bartram can be contacted at: s.m.bartram@lancaster.ac.uk