Hiding behind the hedge: The relevance of firm value in corporate hedging

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ABSTRACT

This study examined the effect of hedging with derivatives on the value of a sample of the 40 largest non-financial firms listed on the Johannesburg Stock Exchange (JSE) from 2008 to 2012. It applied a univariate and a multivariate approach to determine the effect of using derivatives on firms' Tobin's Q, performance indicators such as return on assets (ROA) and return on equity (ROE), and indicators of firm value such as economic value added (EVA), market value added (MVA), and the market value of shares. The results of these analyses indicate that the use of derivatives had no significant impact on firm value, but there was a significant association between using derivatives, MVA, and the market value of shares. Previous international studies found divergent results on the effects of derivative hedging strategies on firm value. The findings from this study support those studies that found no value premium, and suggest that hedging with derivatives is not a value-adding strategy for South African firms. Further research is needed to examine the extent and effectiveness of the use of derivatives by firms in South Africa.

INTRODUCTION

The field of corporate hedging has received increasing attention in recent years, because managers, owners, shareholders, and other stakeholders in firms need to know how to manage the multitude of financial risks that firms face in an increasingly competitive global market. It is therefore of the utmost importance that firms protect and increase their firm value. The main focus of the study was to discover whether hedging practices, particularly hedging with derivatives, add to firm value for a sample of the 40 largest non-financial firms listed on the Johannesburg Stock Exchange (JSE) between 2008 and 2012.

Firm value was proxied by Tobin's Q, the ratio between the combined market value of a firm's equity and debt and its replacement value (Tobin and Brainard, 1977; Tobin, 1969). The definition of firm value in this study corres-ponds to similar studies that have used Tobin's Q as a proxy for firm value (Bielmeier and Nansing, 2013; Búa, González, López and Santomil, 2013; Jankensgård, 2013). This study added to the methodology, however, by including other determinants of firm value: return on assets (ROA), return on equity (ROE), the market value of equity, economic value added (EVA), and market value added (MVA).

Prior studies on corporate hedging, such as the work of Allayanis, Lel and Miller (2012), Bartram, Brown and Fehle (2009) and Géczy, Minton and Schrand (1997), have focused on developed markets, and in particular on firms in the United States (US). In South Africa, very little research has thus far been done on either the extent of corporate hedging with derivatives or the impact on, and value relevance of, corporate hedging on firms' value. This study attempts to add to the body of knowledge about the use of derivatives in South Africa, and about the impact of hedging strategies using derivatives on the value of a firm.

Some recent international studies have investigated the effect of corporate hedging on firm value. A study of firms in 47 countries reports that using derivatives had a positive effect on firm value (Bartram, Brown and Conrad, 2011). Using derivatives seems to add a value premium to firms in Sweden, but only if they follow a highly centralised approach (Jankensgård, 2013: 23). In Spain, a value premium for hedging with derivatives was noted, and the volume of hedging with currency derivatives and

foreign currency debt added to firm value, while operational hedging did not (Búa, González, López and Santomil, 2013: 30). In Germany, however, the use of derivatives for non-financial firms did not appear to add value (Bielmeier and Nansing, 2013: 38). It is clear that there is not yet consensus on whether or not the use of derivatives as part of a corporate hedging strategy is a value-adding exercise for businesses.

The remainder of this study is organised as follows: a review of relevant available literature on the topic of derivatives hedging is presented next, followed by an explanation of the research methodology and a discussion of the empirical results from the various analyses. The study ends with a summary of the findings, conclusions, and suggestions for future research.

RISK MANAGEMENT

A significant amount of prior research has focused on finding the determinants of corporate hedging and on using derivatives as part of a hedging policy. Contemporary research in the field of risk management can be broadly categorised into three components: (i) empirical evidence on the determinants of hedging policy and risk management practices; (ii) evidence on the extent of and motivation behind hedging practices using samples of firms; and (iii) literature on whether risk management adds to firm value.

Determinants of hedging policy and risk management practices

Contemporary corporate risk management theory suggests that firm value can be increased by active and involved management, given the existence of market imperfections. There are various capital market imperfections that lead firms to pursue active corporate risk management to enhance shareholder value, such as transaction costs, agency costs, the risk of financial distress and bankruptcy costs, and the existence of taxes (Aretz, Bartram and Dufey, 2007: 445). It seems that risk management can increase firm value by reducing transaction costs and cash flow volatility (Aretz *et al*., 2007). Risk management can also reduce cash flow fluctuations in pre-tax income, which can, in turn, decrease the firm's tax burden if corporate income is subject to a convex tax liability; but there is conflicting empirical evidence in support of hedging at firm level (Aretz *et al*., 2007).

Other reasons for firms to hedge have been cited, including an attempt to reduce corporate tax liability, to mitigate the expected cost of financial distress, to resolve conflict of interest between bondholders and shareholders, to enhance coordination between the financing and investment policies, and to maximise the financial worth of managers' portfolios (Judge, 2006: 3).

Capital markets tend to be imperfect, and market imperfections can give rise to a need to hedge (Berman and Bertou, 2009: 103). Transaction costs for derivative instruments are relatively low, making them attractive as part of a corporate risk management strategy (Graham and Rogers, 2000: 837). The use of derivatives can lead to an increase in firm value by increasing the firm's debt capacity and the tax benefits attached to the interest payments. Firms were found to hedge in response to the high cost of financial distress. Larger firms were also found to hedge more with derivatives, indicating that there could be a substantial cost associated with the implementation of a derivatives hedging strategy that smaller firms cannot afford (Graham and Rogers, 2002: 837).

Using foreign currency derivatives appears to increase firm value, but using foreign currency debt did not increase firm value for firms in the United Kingdom (UK) (Clark and Judge, 2009: 637-639).

Other reasons for hedging strategies in firms relate to the risk aversion of firms' managers. Moreover, there seems to be a positive relationship between managers' stock and portfolios of stock options in the US, and a finding that hedging and hedging activities are positively correlated with the sensitivity of managers' stock and portfolios of stock options compared with the stock price (Knopf, Nam and Thornton, 2002: 812-813). This suggests that there is some incentive for managers to hedge. In other words, firms are more likely to hedge if the sensitivity of managers' stock and portfolios of stock options to stock return volatility increases.

An important incentive to hedge with derivative instruments is the potential decrease in earnings volatility (and a strong association between low reported earnings volatility, and firms' use of derivative instruments has been reported [Beneda, 2013: 165,179]). It has been claimed that using cash flow hedging to smooth reported earnings is effective (Beneda, 2013). It has been argued that the accounting standard, SFAS 133, provides the first complete reporting coverage of all derivative instruments, and that more sophisticated reporting rules and coverage may explain the firms' purpose and intent in using derivatives for hedging rather than speculative purposes, making it possible to capture the underlying reason for using derivatives more accurately in financial statements (Beneda, 2013).

The extent and motivation behind hedging practices

A comprehensive study to explore the available empirical evidence in support of the notion that risk management and the use of derivatives have a positive effect on a firm's value shows that, in general, the evidence would support the hypotheses (Smithson and Simkins, 2005: 8-9).

A comprehensive international study on the use of derivatives reported that the use of derivatives was widespread, with 60.3 per cent of firms in a sample of 7 319 non-financial firms using some form of derivative instrument (Bartram *et al*., 2009). The same study revealed

that the use of derivatives was significantly related to financial characteristics such as leverage, debt maturity, firms' holdings of liquid assets, dividend policy and operational hedges. Firms in countries with less-liquid derivatives markets – for the most part, in Africa and Latin America – were found to be less likely to hedge.

There is strong evidence that the use of currency derivatives for firms in a sample of 39 countries that have a high level of internal firm governance or external country level of governance is associated with a significant value premium (Allayannis *et al*., 2012:76).

Nevertheless, there are several problems with the use of derivatives (Stulz, 2004: 33-34). The first problem is the fact that there is no consensus on how to price derivatives. Although the Black-Scholes-Merton model has been in use since the 1970s, it depends on a number of simplifying assumptions, and these do not always hold true in the real world. Secondly, the complexity of accounting standards such as SFAS 133 and IAS 39, which dictate how financial instruments should be disclosed in the financial records of an entity, can lead firms to mismanage their derivative positions. Lastly, derivatives trading generates not only additional revenue but also additional risks that might not be measured accurately. Thus it is possible that the benefits of trading derivatives will outweigh the risks, as long as a firm's management understands and mitigates the risk involved in using derivatives (Stulz, 2004: 34).

Risk management and firm value

Studies in different countries have had divergent results. Among UK firms the evidence concurred, for the most part, with similar studies in the US: larger firms and international firms are more likely to use derivatives, and public firms are more likely to use derivatives than private firms. There was a significant relationship between firm value as measured by Tobin's Q on the one hand, and hedging with foreign currency and interest rate derivative instruments on the other; and there were larger value effects for firms in the UK than in comparable prior studies performed on firms in the US (Belghitar, Clark and Judge, 2008: 47). For firms in the UK, managing cash flows and the market value of the firm were found to be the most important reasons for firms to hedge (El-Masry, 2006: 157).

In Spain, a value premium was reported (Búa *et al.*, 2013), and the authors suggested that the study could be extended to other countries with open economies that are well industrialised and have unrestricted capital markets. In Germany, hedging with derivatives for firms did not add to firm value (Bielmeier and Nansing, 2013: 38). This was ascribed to the specific characteristics of the German market and German firms, the use of foreign debt as a hedging tool as a substitute for foreign exchange derivatives, and the argument that operational hedging, such as diversification and matching cash flows, can reduce the need to hedge foreign exchange exposure through derivatives. Another study of German firms indicated a positive relationship between internationalisation and foreign exchange hedging, and that high levels of internationalisation through diversification and operational hedging can reduce the need for foreign exchange rate hedging (Aabo and Ploeen, 2013). In one large sample of German firms, 90 per cent used derivatives – but the majority of these firms did so selectively (Glaum, 2002:121).

One study reported that there was a value premium of 15 per cent for Swedish firms that used a centralised approach to managing foreign exchange exposure (Jankensgård, 2013: 23), but that there was no such premium for firms in which subsidiaries retained bank contacts and decision-making authority about derivatives usage.

Two studies of firms in France failed to find evidence that hedging with derivatives added value to them (Belghitar, Clark and Mefteh, 2013: 285, 290, 291; Khediri and Folus, 2010: 998). These studies explain this on the basis of differences between French firms and their US counterparts, as well as the use of derivatives for possible speculative purposes – cloaked as hedging strategies – that increase exposure rather than mitigate it.

In other parts of the world, the findings mostly concur with those of studies in the US: that the use of derivatives as part of a risk management programme is a value-enhancing activity. Examples include Pakistan (Afza and Alam, 2011: 5794, 5796-5797), Malaysia (Ameer, 2010:124), and New Zealand (Prevost, Rose and Miller, 2000: 751).

RESEARCH METHODOLOGY AND RESULTS

Introduction

Various approaches have been used in the past to assess the impact of hedging strategies on firm value. Early studies had to rely on surveys, since firms were not required to disclose derivative positions in their financial statements. The situation has since changed, and more recent studies have been able to use secondary empirical data. The current study was able to use INET BFA and Thomson Reuters Datastream as sources of secondary data on firms' financial information.

Data analysis

The population in this study were the top 40 non-financial, JSE-listed firms in terms of their market capitalisation in September 2014 (when the data-collection process was started). The sample consisted of these 40 firms, and remained fixed during the sample period of 2008-2012 (see Appendix A). These firms were all still listed on the JSE when the data-collection process was completed in February 2015. The sample period was chosen to look at five specific years, 2008-2012, as the financial statements and their accompanying notes were available for all the firms in the sample during this period.

INET BFA provided the data for the values of derivatives. The annual reports of the firms were also used in the data-collection process: their financial statements, with their accompanying notes, were scrutinised for the disclosed derivatives' values. These values represent the fair value, or the value at carrying amount, that firms disclosed during their respective financial years at the financial year-end. The values were captured at the fair value (or carrying amounts) at the financial year-end as an asset or a liability. The logarithm of the total derivative assets, and the logarithm of the total derivative liabilities disclosed in the financial year-ends for the sample period 2008-2012, were created to standardise the use of derivatives over the sample of 40 firms. Next, the difference between the logarithm of total derivative assets and the logarithm of total derivative liabilities was created to determine the logarithm of the net derivative position. Table 1 presents a list of financial performance indicators, indicators of a firm's value and the values of derivatives disclosed by the firms.

In line with prior research by Bielmeier and Nansing (2013), Búa *et al*. (2013) and Jankensgård (2013), Tobin's Q was used as a proxy for firm value. The study was expanded to determine the impact that the use of derivatives had on other indicators of a firm's value: the market value of equity (MVE), EVA, MVA, and the impact on financial performance indicators. The ROA and ROE were used as financial performance indicators. The authors consider this a methodological contribution to the body of knowledge. The values for these dependent variables were sourced from Thomson Reuters Datastream and INET BFA.

A review of the sample revealed that all firms selected in the sample used derivative instruments at least once during the five-year period of the dataset. Almost all types of derivatives were used, including foreign exchange derivatives, interest rate derivatives and credit derivatives, as well as those based on commodity prices. The firms are relatively large (based on the logarithm of total assets and market value of equity at year-end) and are fairly heavily leveraged (represented by a high debt to equity ratio). All datapoints where derivatives were used by firms were included in the dataset. Where firms did not have derivative asset or liability values, they were included at a value of zero in the dataset. The depth of derivatives' use by firms in the sample shows how widespread the use of derivatives is in the South African market, and how well-developed this market is.

The average amount for derivatives recognised as assets in the sample period was R778.9 million. Derivative liabilities recognised in the same period equalled an average of R1 161.4 million. The total amount for derivatives recognised as liabilities therefore exceeded that for the derivatives recognised as assets by an average of R382.5 million. This finding could be indicative of the difficult economic climate experienced during the 2008-2012 sample period.

The difference between the mean (R778.9 million) and median (R33.1 million) could imply some skewness in the sample; but it could also be indicative of the different sizes of the firms in the sample. As has already been noted in the literature review, larger firms are more likely to use derivatives. The JSE is unique in that, while the stock exchange is comparatively small, it is well-developed and efficiently managed – and also because a few large firms dominate the exchange in terms of their market capitalisation.

TABLE 1
DESCRIPTIVE STATISTICS

Dependent variable	Mean	Median	Standard deviation	Minimum	Maximum
ROA*	13.74	11.42	11.6	-21.51	87.3
ROE*	26.83	22.29	27.6	-131.27	177.5
Tobin's Q**	2.06	1.78	1.23	0	9.15
EVA***	4 291 034	504 991	14 219 343	-24 217 868	96 033 877
EVA scaled****	5.13	1.27	14.12	-24.26	85.8
MVA*****	2.85	2.27	2.02	0	13.85
DerivativesTA***	778.93	33.1	2483.41	0	27430
LogDerTA	3.43	3.5	2.96	-2.96	10.22
DerivativesTL***	1 161.39	65.6	3 397.79	0	30 952
LogDerTL	4.06	4.18	2.86	-1.57	10.34
DerivativesTA-TL***	-308.82	-1	2 441.1	-17 422	7 532
LogDerTA-TL	-0.61	-0.82	5.22	9.77	8.93

Descriptors of the dependent variables: *Percentage; **Ratio; ***R million; ****EVA divided by the number of outstanding shares; *****Difference between the current market value of the firm and the capital contributed by its shareholders; Log = Logarithm

The potential impact of the sample distribution on the results of the analysis was dealt with in several different ways. Skewness in the sample was reduced by eliminating outliers. Observations exceeding 2.5 standard deviations from the mean in the sample of firms were deleted. The total number of observations was reduced from 225 to 203. To reduce skewness for the captured derivatives' values, the natural logarithm was used.

The detailed findings from the univariate and multivariate analyses are discussed in the sections that follow.

Univariate analysis

Seven dependent variables were used for the univariate analysis: ROA, ROE, Tobin's Q, EVA, EVA scaled, MVE year-end scaled, and MVE three-months scaled. The EVA and market value of equity variables were scaled by the number of outstanding shares to standardise the values. The sample included 225 observations for values captured at the financial year-end in the sample time period of 2008-2012.

The logarithm of the difference between derivative assets and liabilities displayed a positive relationship, with the dependent variables at a one per cent significance level, interpreting the Pearson correlation coefficients. The logarithm displayed a positive relationship with ROA (0.217, p = 0.001), ROE (0.222, p = 0.007), Tobin's Q (0.174, p = 0.009), MVE scaled (0.220, p = 0.001) and MVE three-months scaled (0.228, p = 0.001). There seemed to be no correlation between the use of derivatives and EVA when evaluating the Pearson correlation coefficient (p = 0.350), or with EVA scaled (0.063, p = 0.120).

When evaluating the Spearman rank correlation coefficients, the logarithm of the difference between derivatives as assets and liabilities displayed a positive relationship at a one per cent level of significance for ROA (0.223, p = 0.001), Tobin's Q (0.180, p = 0.007), MVE scaled (-0.200, p = 0.003) and MV three-months scaled (0.203, p = 0.002). It displayed a relationship at a five per cent level of significance for ROE (0.149, p = 0.026) and no relationship with EVA or EVA scaled.

The other independent variables displayed a relationship both with the Pearson correlation coefficients and Spearman rank correlation coefficients. Most notably, there were correlations at a one per cent significance level for the logarithm of total assets on the dependent variables (excluding EVA). Correlations at a one per cent significance level also exist for the current ratio on ROA and on MV year-end and MV three-months scaled. The debt to equity ratio relative to ROA and MV year-end and MV three-months scaled display a significant relationship at a one per cent level of significance.

Multivariate analysis

A regression analysis was used in Statistical Analysis Software (SAS) to investigate the relationship between derivatives usage and the different control variables of hedging practices on firm value. SAS is a software suite developed for advanced analytics, business intelligence, data management and predictive analytics.

This study attempted to isolate the impact of the use of derivatives on firm value by using a multivariate analysis to include other control variables that are also known drivers of firm value. Previous research by Bielmeier and Nansing (2013), Búa *et al*. (2013), Jankensgård (2013), Khediri and Folus (2010) and Allayannis and Weston (2001) included control variables in their analyses.

The following control variables were included in this study:

- Size: Firm size has been identified as a determinant of the likelihood that firms will hedge (Graham and Rogers, 2000; Gézcy *et al*., 1997). For this reason, a size variable calculated by the logarithm of total assets was approximated.
- Financial restrictions: Firms that have little access to free cash flow and external funding are less likely to invest in projects with an expected negative net present value (NPV); thus the ratio of current assets divided by current liabilities was used as a proxy for financial restrictions.
- Leverage: Differences in firms' capital structures can have a differential impact on firm values. Firms with larger debt structures are likely to have higher firm value due to the positive tax effects on this value. To account for differences in capital structure, the ratio of a firm's total debt divided by total shareholders' equity was used as a control variable.
- Economic profitability: A value premium associated with profitability can skew the value of Tobin's Q for more profitable firms. A proxy variable for profitability calculated as earnings before interest and tax (EBIT) divided by total assets was used.
- Growth opportunities: Growth opportunities are expected to have a positive relationship with firm value. Firms with more growth opportunities are more likely to hedge in order to minimise cash flow volatility (Keloharju and Niskanen, 2001). The ratio of research and development (R&D) expenses to total sales, together with the percentage of intangible assets to total assets, were used as proxies.
- Geographic diversification: The percentage of foreign sales to total sales was used as a proxy for geographic diversification. This is an important variable that contributes to firm value. Allayannis and Weston (2001: 243) found that diversification can destroy value by creating agency problems, but Bodnar, Tang and Weintrop (1997: 25) found several factors relating to market value that are positively correlated with geographic diversification.
- Business sector: Firms in different sectors of the economy have different idiosyncratic variables that contribute to firm value. This study looked specifically at the top 40 non-financial firms listed on the JSE.

The following equation was created:

Dependent variable = $\alpha + \alpha\Sigma Ind + \beta Size + \beta Liq + \beta Lev + \beta Prof + \beta Growth1 + \beta Growth2 + \beta Geo + \beta Der + \varepsilon$

Where:

α	=	intercept
$\alpha\Sigma Ind$	=	different sectors in which the firms in the sample operate
$\beta Size$	=	control variable for size
βLiq	=	current ratio = liquidity
$BLev$	=	level of leverage for each firm (the ratio of total debt divided by shareholders' equity)
$\beta Prof$	=	profitability, ratio of EBIT divided by total assets
$BGrowth1$	=	ratio of research and development expenses divided by total sales
$\beta Growth2$	=	ratio of intangible assets divided by total assets
βGeo	=	geographic diversification for each firm (ratio of foreign sales divided by total sales)
βDer	=	logarithm of the difference between total derivatives disclosed as assets in the financial statements of each firm and total derivatives disclosed as liabilities
ε	=	error term

To account for serial correlation and its associated influence on the results, and to account for the problems of endogeneity, the maximum likelihood estimate auto-regressive analysis was employed instead of ordinary least squares (OLS). This method was more appropriate for this particular analysis than the OLS method, because it accounted for the time series element in the dataset, which the OLS method did not. A parameter or variable in a statistical model is said to be endogenous when there is a correlation between the parameter or variable and the error term. The likelihood function indicates how likely the observed sample is as a function of possible parameter values. Maximising the likelihood function defines the parameters that are most likely to produce the surveyed data. Residual terms are typically independent and identically standard normal $N(0,1)$ distributed.

The results from this regression analysis are presented in Table 2.

The findings from the multivariate analysis revealed that using derivatives did not add to firm value. The use of derivatives had no impact at any level of significance (0.0136, p = 0.1481) if Tobin's Q was used as a proxy for firm value. The use of derivatives also had no impact on the profitability ratios, namely ROA (0.0978, p = 0.6384) and ROE (0.0871, p = 0.6173). Where the use of derivatives was measured against EVA scaled or MV year-end scaled as dependent variables, such use of derivatives also had no significant impact (-0.2518, p = 0.1667 and 0.002269, p = 0.1673 respectively).

TABLE 2
MULTIVARIATE ANALYSIS OF THE VALUE EFFECTS FROM THE USE OF DERIVATIVES

Control variable	Tobin's Q	ROA	ROE	EVA scaled	MVA	MV year-end scaled	MV three-month scaled
Size	-0.1361 (0.0488)**	0.8862 (0.1942)	1.1265 (0.3509)	1.7102 (0.1691)	-0.3020 (0.0066)***	-0.00034 (0.9761)	0.002719 (0.8142)
Liquidity	0.0853 (0.2707)	2.9458 (0.0002)***	-0.9226 (0.5018)	-0.9757 (0.4902)	-0.1066 (0.3879)	-0.0173 (0.1841)	-0.0212 (0.1083)
Leverage	0.000217 (0.3679)	0.004371 (0.0779)*	-0.0332 (<0.0001)***	0.009045 (0.0482)**	0.000471 (0.2168)	0.000027 (0.5084)	0.000037 (0.3462)
Profitability	2.8088 (<0.0001)***	72.9831 (<0.0001)***	141.2942 (<0.0001)***	74.1637 (<0.0001)***	3.5853 (0.0001)***	0.243 (0.0147)**	0.3661 (0.0002)***
Growth prospects (βGrowth1)	-44.5388 (0.3018)	76.8789 (0.8592)	804.6208 (0.2964)	-16.8061 (0.9832)	22.8608 (0.7370)	14.8816 (0.0495)**	11.9744 (0.1067)
Growth prospects (βGrowth2)	2.4473 (0.0058)***	-4.4059 (0.6277)	24.0459 (0.1397)	-18.1987 (0.2729)	2.5504 (0.0687)*	-0.0199 (0.8968)	-0.0479 (0.7427)
Geographic diversification	0.002134 (0.2928)	-0.0229 (0.2729)	-0.0331 (0.3705)	-0.0181 (0.6382)	0.002649 (0.4069)	0.00044 (0.2026)	0.000956 (0.0046)***
Derivatives	0.0136 (0.1481)	0.0978 (0.6384)	0.0871 (0.6173)	-0.2518 (0.1667)	0.1398 (0.0218)**	0.002269 (0.1673)	0.002542 (0.0993)*
N	203	203	203	203	203	203	203
Structural R^2 (per cent)	74.55	72.32	81.02	49.76	78.96	67.42	67.24

Notes: p-values for two-tailed significance in brackets; *Significant at a ten per cent level; **Significant at a five per cent level; ***Significant at a one per cent level.

Interestingly, derivatives usage did add to MVA at a five per cent level of significance (0.1398, p = 0.0218). MVA is the difference between the current market value of a firm and the capital contributed by its shareholders. This implies that the use of derivatives does have some impact on the ability of firms to create value. The use of derivatives also had an impact on the market value of equity three months after the reporting date (0.002542, p = 0.0993) at a ten per cent level of significance.

Robustness analysis

The robustness of this study was enhanced in several ways. The initial sample was reduced by removing any outliers more than 2.5 standard deviations greater than the mean, which could have had an impact on the findings of the study.

In the multivariate analysis, the maximum likelihood estimates approach was followed. The results of the analyses were tested for autocorrelation. The Durbin-Watson statistic of 2.0384 for the regression analysis of Tobin's Q indicated little serial correlation. The R^2 of 74.55 per cent for the same analysis indicated reasonable robustness. Some of the dependent variables, such as EVA and market value for equity, were scaled by the number of shares outstanding to make the values more comparable.

The Lagrange multiplier test (LM test) of under-identification was reported to determine whether the regression model was identified, and whether excluded instruments were relevant. The R^2 values for the auto regressions confirmed that the models were reasonably well-fitted.

Discussion of results

The results from this study contradict the findings of most prior studies (Bartram, Brown and Conrad, 2011; Belghitar, Clark and Judge, 2008; Allayanis and Weston, 2001), which focused mainly on firms in the US and the UK. A possible explanation for the lack of similarity between the findings may be major differences in both the structure of the economies of South Africa and the US, and differences in investor behaviour and perceptions. To explain similarly contradictory results, Khediri and Folus (2010) argue that investors in France face larger information asymmetry than those in the US, and that investors in France find it difficult to judge whether firms use derivatives for hedging purposes. Consequently, they found that investors regarded firms that used derivatives as more risky investment propositions. The same might apply to investors' perceptions of South African firms that use derivatives.

There are other tools and strategies that firms can use to hedge. These include operational hedging, the use of foreign debt, and the pass-through of price risk onto customers (Bartram, Brown and Minton, 2010: 149). However, data on foreign debt are not readily available, so it is difficult to compare the extent to which firms use derivatives for hedging purposes compared with the use of foreign debt to hedge. German firms are heavily export-oriented, and probably also rely strongly on foreign debt as a hedging tool (Bielmeier and Nansing, 2013). This could have a negative impact on the ability to create value by using derivatives for firm value, since these two strategies are considered to be substitutes for each other (Elliot, Huffman and Makar, 2003; Géczy *et al*., 1997). This theory could be extended to the use of operational hedging, pass-through of price risk, and diversification. The use of such strategies can both reduce the need to use derivatives and have a negative impact on the quality of a derivatives hedging programme.

Selective hedging can inadvertently add a speculative element to hedging strategies (Glaum, 2002: 121), and this is not to the benefit of shareholders because of the increase in risk. The expected benefits from selective hedging may be small at best (Adam and Chitru, 2006). It is therefore possible that there was a speculative element in the use of derivatives by the firms in the present study's sample that was not accurately captured by the regression analysis. It is also possible that South African firms use derivatives to speculate on the markets, and do so more than their peers in the US and the UK.

It has been argued that the failure to exploit either good or bad (loss-causing) exposure in positive or negative moves in the derivatives market is not necessarily indicative of whether or not using derivatives adds value to a firm (Belghitar *et al*., 2013). Exposure reduction in itself can also lead to an increase in firm value, but the gains from such a use of derivatives should exceed the cost associated with it. This study's findings concur with those of Belghitar *et al*. (2013).

CONCLUSIONS AND RECOMMENDATIONS

This study used a sample of the largest 40 non-financial firms listed on the JSE from 2008 to 2012 in order to analyse value creation through the use of derivatives. The study adopted both a univariate and a multivariate analysis approach, and controlled for unobservable heterogeneity and endogeneity problems. The study also used multiple proxies for firm value to determine the impact that using derivatives had on the sample firms' ROA, ROE, EVA, MVA and the market value of equity. Overall, no conclusive evidence was found that hedging with derivatives has a positive effect on firm value.

The results are robust in respect of the use of control variables (size, profitability, leverage, growth prospects, different sectors in which the firms operate, and geographic diversification), the use of more than one proxy for firm value, and the effect of outliers. Moreover, the maximum likelihood estimates approach was used because of the time series nature of the dataset.

The results of this study contradict those of Búa *et al*. (2013) and Allayanis and Weston (2001), who found that there is a value creation premium for derivative-hedging strategies being employed by firms. However, the findings of this study concur with those of Bielmeier and Nansing (2013) and Khediri and Folus (2010), who found no such value premium, and cited structural differences between firms in the US, France and Germany as possible reasons for the differences between their findings and those of studies focusing on the US only. It is therefore possible that there are structural differences between the economy of South Africa and those of the countries where similar studies were done, which could explain why a value premium for derivative usage was not found.

A further reason for the differences in findings could be that the South African economy is dominated by a few large firms, unlike stock exchanges in the US and Europe, where other studies have been done. Idiosyncratic management in one or two large firms could also skew the findings of the study, so in future a larger sample could be used to test the robustness of this exploratory study. Furthermore, the cost implications of a derivatives programme could lead to larger firms using derivatives more extensively than smaller firms within the sample (Graham and Rogers, 2002: 837).

The study looked at a specific sample of firms during a selected sample period (2008-2012) that included the global financial crisis of 2008. The authors suggest that the current study could be extended to look at specific time periods – for example, a pre-financial crisis period versus a post-financial crisis period – to determine the impact that the global financial crisis had on the value relevance of derivatives hedging. Most firms struggle in an economic recession, so a comparative analysis during economic boom years could shed some light not only on the ability of firms to predict market movements and hedge accordingly, but also on how they use derivatives and whether they use them for hedging or speculative reasons.

LIMITATIONS AND SUGGESTIONS FOR FUTURE RESEARCH

The limitations of this research are mainly associated with the availability of information. Although every effort was made to obtain all the relevant information, the study was limited to firms' information that was available in annual reports and in databases and repositories of financial data. The dataset also includes only 40 firms, so it might be worthwhile to use a larger sample in future studies. The study focused on the total number of derivatives used as disclosed by firms in their financial statements. Future studies might explore in more detail the different types of derivatives instruments that firms use – commodity, exchange rate and interest rate derivative instruments – either by looking at financial statements or by conducting surveys. A future study could also investigate the impact that each of these instruments might have on firm value.

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