Foreign Currency Debt Financing, Firm Value, and Risk: Evidence from Korea Surrounding Global Financial Crisis

Sung C. Bae[a*], Hyeon Sook Kim,[b] Taek Ho Kwon[c]

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* Corresponding author; Tel) 419-372-8714; E-mail) bae@bgsu.edu

[a] Bae is Professor at the Department of Finance, College of Business Administration, Bowling Green State University in Bowling Green, OH, USA; Tel) 419-372-8714; E-mail) bae@bgsu.edu.
[b] Kim is a doctoral student at the School of Business, Chungnam National University in Daejon, Korea; E-mail) khsvega1@cnu.ac.kr.
[c] Kwon is Professor at the School of Business, Chungnam National University in Daejon, Korea; Tel) 82-42-821-5533; E-mail) thk5556@cnu.ac.kr.

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Abstract

We examine the valuation effect of foreign currency (FC) debt financing, relative to local currency (LC) debt financing. Employing extensive data of Korean firms during 2002-2012, we document strong evidence that firms using FC debt financing have significantly lower values than firms using LC debt financing. Even during the pre-global financial crisis period when the LC value appreciated, we find no evidence of an increase in firm value associated with FC debt financing. Further analyses on the possible causes of the negative association of FC debt and firm value reject the conjecture of higher firm risk resulting from the usage of FC debt but lend empirical support for the excessive cost of hedging. While the frequent and heavy usages of currency derivatives by Korean firms with FC debt financing lead to lower firm risk, such usages fail to generate higher firm values at least in part due to their excessive costs of hedging with currency derivatives. Our empirical results remain robust to different model and sample specifications.

JEL Classification: F31; G15
Key words: Foreign currency debt financing; Local currency debt financing; Firm value; Firm risk; Korean firms; Global financial crisis

1. Introduction

Over the past decades, foreign currency (FC, hereafter) debt financing has made a significant contribution to the growth of business firms in emerging economies. The usage of FC debt, however, has also affected these firms' operations negatively. The Asian financial crisis in 1997 reaffirmed that the usage of FC debt could bring in significant risk to borrowing firms. Although the usage of FC debt declined after the Asian financial crisis, it started to increase again, reaching the highest level during the global financial crisis in 2007. Furthermore, since the global financial crisis, there has been a big increase in FC bond issuance by emerging market firms, while FC bank loans provided by Western banks have remained flat. According to the Bank for International Settlements, firms other than banks in the emerging markets have issued $692 billion in international bonds during the post-crisis period. Whether the increase in FC debt around the global financial crisis has brought in a positive or negative effect on firm value and other firm characteristics is an important piece of information for both investors and corporate managers, and is the main issue explored in our paper.

A small number of existing studies have examined firms' usage of FC debt but offered limited and inconclusive evidence on the effect of FC debt financing on firm value. In a study of Asian firms during the Asian financial crisis of 1997-1999, Allaynnis et al. (2003) find that all debt including FC debt brought a negative effect on firms' performance such as return on assets, earnings coverage ratio and borrowing risk. Ghosh (2008) documents similar evidence for Indian firms during 1995-2004. He further shows that firms participating in the international debt markets reveal more pronounced negative effects. In a study of U.K. firms, Clark and Judge (2009) do not find conclusive evidence on the positive effect of FC debt on firm value. They note that the reason for this inconclusive evidence is mainly due to many constraints accompanying the management of foreign exchange risk using FC debt. In contrast, Harvey et al. (2004) find a disciplinary role of debt including FC debt in 18 emerging market countries during 1995-1996. Their results show that the usage of FC debt leads to better firm performance in terms of CAR. They attribute their findings to the high standards of financial disclosure that these firms must satisfy for foreign creditors, suggesting that for emerging markets FC debt plays as an effective mechanism to

reduce firms' agency costs.

As noted above, the current literature on the usage of FC debt lacks convincing and conclusive evidence on the valuation effect of FC debt financing. Moreover, while a few studies focusing on emerging economies investigate FC debt financing surrounding the 1997 Asian financial crisis and for the period of the depreciation of LCs in late 1990s and early 2000 (Allaynnis et al., 2003; Ghosh, 2008), little research has been done for emerging market firms surrounding the 2007 global financial crisis nor for the more recent period of the appreciation of LCs.[1] Our paper intends to fill this void. FC debt financing of emerging market firms may pose different characteristics and valuation effects during the global financial crisis than during the Asian financial crisis as well as before and after the global financial crisis due to the changes in the characteristics of borrowing firms and global capital markets.

In this paper, we investigate the effects of FC debt financing on firm value and risk. For this purpose, we develop two competing hypotheses based on empirical evidence from extant studies—cost reduction hypothesis and risk aggravation hypothesis. On the one hand, FC debt financing may have a positive impact on firm value because borrowing through FC debt would be more cost effective than borrowing through LC debt with respect to interest rates, loan size, regulations, agency costs, and hedging, among others. On the other hand, FC debt financing may deteriorate firm value mainly due to the increased borrowing risk resulting from an increase in foreign exchange risk, liquidity mismatch, and/or currency mismatch. We then test these hypotheses by comparing the characteristics of firms using FC debt with those of firms using domestic or local currency (LC, thereafter) debt and analyzing the relationships of FC debt financing with firm value and risk.

We focus on Korean manufacturing firms. Considering that Korea has experienced one of the most volatile exchange rate changes in Asia since the Asian financial crisis, and that Korean firms frequently resort to FC debt, Korean firms are an excellent experimental laboratory to test our hypotheses on the valuation effects of FC debt financing.

[1] As indirect evidence, Bleakley and Cowan (2008) and Endrész and Harasztosi (2014) show that during the global financial crisis, firms using more FC debt significantly reduce their investments, compared to firms using less FC debt due to the balance sheet effect of FC debt.

Employing extensive firm-level data during 2002-2012, we find that firms using FC debt have significantly lower values than firms using LC debt, and that this negative valuation effect of FC debt financing is persistent across all surrounding periods of the global financial crisis. Even during the pre-global financial crisis period of 2002-2006 when the value of local Korean won appreciated relative to US dollar, FC debt financing fails to generate a positive effect on firm value. These results are in supportive of the risk aggravation hypothesis of FC debt financing.

We further explore two potential causes of lower values for firms using FC debt financing. First, we conjecture whether the lower firm value for firms using FC debt is attributable to the increased risk associated with the usage of FC debt. The results from our analysis of firm risk reveal that firms using FC debt carry lower, not higher, firm risk, whose evidence rejects the possible link of FC debt financing with an increase in firm risk. We then wonder if firms with lower firm risk mainly use FC debt financing. Additional analysis shows that the usage of FC debt is also pervasive among firms with high firm risk, rejecting the possible endogeneity issue. Second, we conjecture whether the excessive costs of hedging through the frequent and heavy usages of currency derivatives by firms with FC debt are attributed to the lower firm values of these firms, though such usages help the firms reduce their firm risk. We offer some empirical evidence in supportive of this conjecture.

We interpret our evidence of lower values for firms with FC debt financing and their excessive costs of hedging as a potential cause to be consistent with the findings in the current literature. In particular, Allaynnis et al. (2003) refer to the underdeveloped derivatives markets in the Asian countries as the main reason that the usage of FC debt hedged through currency derivatives for firms in these emerging markets deteriorates their operating and financial performances. In a similar context, Clark and Judge (2009) also attribute the reason for failing to relate FC debt financing to an increase in firm value to many constraints accompanying the management of foreign exchange risk using FC debt.

Our paper is organized as follows. Section 2 develops testing hypotheses based on empirical evidence in existing studies. Section 3 presents empirical models and data, and Section 4 reports empirical results and robustness tests, with summary and conclusion in Section 5.

2. Development of Testing Hypotheses

In a perfect market environment, a firm's capital structure would not affect the value of the firm, as advanced by Modigliani and Miller's (1958) capital structure irrelevancy theory. Hence, how a firm raises its capital through debt or equity would not have an impact on its value. In a practical world, however, a firm's leverage ratio would affect its value due to several market imperfections such as taxes, information asymmetry, regulations, etc. Similarly, whether a firm raises its debt capital in a domestic market (LC debt) or in foreign markets (FC debt) would also affect firm value differently. Gozzi et al. (2012) show that debt issues in domestic and international bond markets have different characteristics, which are not explained by differences across firms or their country of origin. Existing studies have documented several rationales of firms' issuance of FC debt. Drawing from these studies, we develop the following hypotheses on the effect of FC debt financing on the value of the borrowing firm.

2.1. Cost reduction hypothesis

FC debt financing may have a positive effect on firm value because borrowing through FC debt would be more cost effective than borrowing through LC debt in several ways. First, FC debt can provide an opportunity to raise the capital at a lower cost than LC debt when the real interest rate of FC debt is lower than that of LC debt. Second, FC debt financing would allow firms to raise much larger amounts of debt when they can access the global capital markets as well as the domestic market. Third, FC debt may play as an effective mechanism to reduce firms' agency costs by meeting high standards of financial disclosure for foreign lenders, especially for firms in emerging markets (Harvey et al., 2004). Fourth, FC debt financing may help to circumvent withholding taxes, capital controls, and other legal restrictions imposed by domestic governments (Shapiro, 1984; Rhee et al., 1985); to overcome segmented local capital markets (Jorion and Schwartz, 1990; Campbell and Hamao, 1992); and to arbitrage differences in tax rates across the world (Smith and Stulz, 1985; DeMarzo and Duffie, 1996).

Lastly, FC debt financing may play as an effective hedging tool for managing foreign exchange

exposure associated mainly with firms' export activities (Keloharju and Niskanen, 2001; Elliot et al., 2003; Kedia and Mozumdar, 2003; Bae and Kwon, 2013), which would translate into an increase in firm value. For example, Bae and Kwon (2013) show that the increased asymmetric exchange exposure resulting from exporting activities of Korean firms can be reduced to some extent through FC debt financing. Gezcy et al. (1997) also show that firms using currency swaps carry relatively higher levels of FC debt than those without currency derivatives, suggesting that currency derivatives and FC debt complement each other in reducing a firm's currency risk exposures.

2.2. Risk aggravation hypothesis

FC debt financing may bring in a negative effect on firm value because the usage of FC debt can expose firms to increased borrowing risk resulting from an increase in foreign exchange risk, liquidity mismatch, and/or currency mismatch, and ill-structured currency derivatives, thus raising the borrowing firms' bankruptcy costs relative to LC debt. If one examines the structure of FC debt and FC assets, one can easily observe that while most FC debt is characterized by relatively high liquidity, most FC assets such as foreign direct investments (FDIs, hereafter) have low liquidity; this leads to a serious liquidity mismatch between FC debt and FC assets. As observed during the global financial crisis, when world economic conditions soured, FC debt turned into liquid short-term debt, causing firms' financial positions to worsen (see, e.g., Bae and Kwon, 2013). Furthermore, when the value of a LC rapidly depreciates like during the global financial crisis, firms holding large FC debt would experience a deterioration of their business performance through a currency mismatch. Currency mismatch occurs when a large amount of debt owned by countries or firms is denominated in FCs, whereas most of their assets and revenues are denominated in LCs. In an economy where a severe currency mismatch exists, a sudden depreciation of a LC magnifies the size of FC debt and thus increases capital costs, which in turn reduces capital investments and deteriorates business performance, known as the balance sheet effect (Krugman, 1999).

Allaynnis et al. (2003) and Ghosh (2008) offer evidence in supportive of this notion in studies of Asian firms during the Asian financial crisis of 1997-1999 and of Indian firms during 1995-2004,

respectively. In particular, Ghosh (2008) attributes his findings to the higher debt ratio and increased capital costs related to the usage of FC debt, which in turn deteriorates firms' cash flows. At the macro-level effects of FC debt, Bordo et al. (2010) show that greater ratios of FC debt to total debt in a country are associated with increased risks of currency and debt crises including 2007 Asian financial crisis, while the strength of the association depends crucially on the size of the country's reserve base and political credibility.

Furthermore, ill-structured currency derivatives in conjunction with FC debt as a hedging mechanism would also cause additional borrowing risk, especially for firms in emerging markets. Allaynnis et al. (2003) show that a FC debt hedged through currency derivatives hurts firms' operating and financial performance due to the underdeveloped derivatives markets in the Asian countries.

3. Research Design

3.1. Regression model and measurement of variables

We test the two hypotheses on the effect of the usage of FC debt financing on firm value by estimating the following multivariate regression model:

$$\begin{aligned} Q_{i,t} &= \beta_0 + \beta_1 FC\_D_{i,t} + \beta_2 PROFIT_{i,t} + \beta_3 EXPORT_{i,t} + \beta_4 RND_{i,t} + \beta_5 DIV_{i,t} \\ &+ \beta_6 DIVER_{i,t} + \beta_7 INTTR_{i,t} + \beta_8 SIZE_{i,t} + \beta_9 CHAEBOL_{i,t} + \beta_{10} LEV_{i,t} \\ &+ \sum_{j=1}^{J} \beta_{10+j} INDDY_{j,i} + \sum_{y=1}^{Y} \beta_{10+J+y} YEARDY_{y,i} + \eta_{i,t} \end{aligned} \tag{1}$$

where *i* and *t* denote firm and year, respectively. In equation (1), the dependent variable, *Q*, is firm value, measured by Tobin's q, and *FC_D* is a key test variable that equals 1 for a firm using FC (financial) debt financing and 0 for a matching firm using LC (financial) debt financing.[2] If the usage of FC debt financing increases firm value, then we would expect β_1 to have a positive and significant regression coefficient. If the usage of FC debt affects firm value negatively, however, β_1 would carry a negative and significant regression coefficient. A set of control variables which are supposedly related to firm value

[2] Detailed discussions of constructing these sample firms are given in Section 3.2.

includes operating profitability (*PROFIT*), export ratio (*EXPORT*), R&D ratio (*RND*), dividend payout (*DIV*), product diversification (*DIVER*), intra-group transactions with foreign subsidiaries (*INTTR*), firm size (*SIZE*), chaebol dummy (*CHAEBOL*), and total debt to total assets ratio (*LEV*). We also include industry and year dummies (*INDDY* and *YEARDY*) to control for the industry and year effects and compute White's (1980) heteroskedasticity robust *t*-statistics.

Regarding the measurement of key variables, a firm's operating profitability (*PROFIT*) is measured by its operating margin, earnings before interest and taxes divided by sales. Export ratio (*EXPORT*) is measured by its exporting amount divided by sales. R&D ratio (*RND*) is measured by the ratio of the firm's R&D expenses to sales. Dividend payout (*DIV*) is measured by its dividend amount standardized by net income. The degree of product and operating diversification (*DIVER*) is measured by the diversification index drawn from the Caves' weighted index of diversification (Caves et al., 1980).[3] A firm's degree of intra-group transactions with foreign subsidiaries (*INTTR*) is measured by the total amount of intra-group transactions each firm engages in with its foreign subsidiaries divided by the firm's sales. Firm size (*SIZE*) is measured by the sum of the book value of total debt and the market values of preferred stock and common stock, and enters regression models in the natural logarithm form. Chaebol dummy (*CHAEBOL*) represents a firm's affiliation to a large Korean business group, known as a chaebol, and is equal to 1 for a chaebol firm and 0 otherwise. Following the Korea Fair Trade Commission's (KFTC) yearly classification, we classify sample firms into two groups: a group of top thirty chaebol firms and a group of other firms.[4] A summary of definitions and measurements of key variables used in the regression model is presented in the Appendix.

We estimate regression equation (1) for two groups of sample firms: the first group (matching sample 1) includes firms using FC debt only (test sample) and firms using LC debt only (control sample), and the second group (matching sample 2) includes firms using FC debt and LC debt (test sample) and

[3] See Bae et al. (2011) for the detailed measurement of the diversification index.

[4] While the KFTC classification is the most widely used practice of classification for business groups based on the size of group-level gross total assets, it is based on some arbitrary cutoff of total assets and is more of a proxy for a large business group affiliation, rather than any group affiliation. See Bae et al. (2011), Baek et al. (2006), and Joh (2003) for further discussions of chaebols.

firms using LC debt only (control sample).

3.2. Data and sample construction

Our sample includes all non-financial firms listed on the Korean stock exchanges that financed any type of FC or LC debt or no debt during the period of 2002–2012. We exclude firms that experienced capital erosion during the sample period. Our sample period starts with 2002 year because 2002 is the first year when data on itemized FC debt and assets for each Korean firm were available from the TS2000 database of Korean Association of Listed Companies. We collect sample firms' balance sheet items including FC assets and FC debt from the TS2000 database. We also collect sample firms' market-related information such as stock returns and market values from the KIS-VALUE database. The data on sample firms' issuances of DRs and GRs during the period of 1992–2012 (for the variable of *EXPER*) are obtained from the Korea Securities Depository database. Our selection procedures result in a total of 6,460 firm-year observations for the preliminary sample.

Because our sample period includes the global financial crisis (GFC) period, we also analyze sample firms by dividing the sample period into two sub-periods based on the changes in LC value of Korean won relative to US dollar—the period of 2002–2006 when the LC value gradually increased, and the period of 2007–2012 when the LC value declined with significant volatility, encompassing the global financial crisis period.[5] Whenever necessary, we also perform our analyses by further dividing the second period into two subperiods of the GFC period (2007-2009) and the post-GFC period (2010-2012). Finally, in order to reduce the effect of possibly spurious outliers, we limit extreme values of top and bottom 1% of all variables in each year through a 99% winsorizing procedure.

In order to analyze the characteristics of firms using FC debt more completely and ensure the reliability of empirical results, we adopt the matching sample approach to construct two samples from the preliminary sample of firms issuing debt: a test sample of firms issuing FC debt and a control sample of

[5] While there is a debate on exactly when the global financial crisis ended, we treat the period of 2007-2009 as the global financial crisis period.

firms issuing LC debt only. Considering the different proportions of FC debt among firms issuing FC debt (test sample), we further classify test sample firms into two subgroups. The first group (matching sample 1) consists of firms issuing FC debt only and firms issuing substantially more FC debt than LC debt in such a way that a firm's FC debt is more than two times of its LC debt. The second group (matching sample 2) consists of firms issuing both FC and LC debt but substantially less FC debt than LC debt in such a way that a firm's FC debt is less than two times of its LC debt. Hence, the first group (matching sample 1) represents firms that finance mainly through FC debt, whereas the second group (matching sample 2) represents firms that finance through both FC debt and LC debt but substantially less FC debt than LC debt. Of 2,886 firm-year observations for the test sample, this reclassification yields 428 and 2,458 observations for the first and second group, respectively. Accordingly, we construct a matching control sample of firms financing only LC debt to each of the two groups of test sample firms.

Following the selection process similar to that used in Harris (1989) and Bae et al. (2004, 2009) for their analyses of stock return volatility, we pair two firms, a firm issuing FC debt and a firm issuing LC debt, that are within the same industry and possess the most similar profiles with respect to several firm-specific attributes such as firm size, debt ratio, diversification index, and export ratio. These variables are widely used in existing studies as being closely related to firm value. The procedure for selection is as follows: (i) Sample firms in each industry are divided into two groups, a FC debt group and a LC debt group; (ii) Regression coefficients of firms issuing FC debt are estimated by regressing each firm′s operating margin against four variables of firm size, debt ratio, diversification index, and export ratio;[6] (iii) The weighted sum of distance of the four variables on the vector space between a FC debt firm and the remaining LC debt firms in the same industry is calculated; (iv) an LC debt firm with the shortest weighted sum of distance is selected as a matching firm to a FC debt firm; (v) the FC debt firm and the selected matching LC debt firm are removed from consideration; and (iv) the processes of (iii) through (v) are repeated until all FC debt firms are matched. Hence, the matching firms with LC debt selected through this procedure have similar characteristics to firms with FC debt in the same industry that do not

[6] See section 3.2 for the discussion of the measurements of these variables.

use FC debt.

Table 1 reports the distribution of sample firms that finance FC and LC debt by year. A firm's FC debt represents FC-denominated short-term and long-term borrowings related to the firm's financing activities and excludes FC-denominated operational debt. Firms using FC debt include two groups of firms based on their proportions of FC debt, one group of firms financing FC debt only and firms financing substantially more FC debt than LC debt and another group of firms financing both FC & LC debt but substantially less FC debt than LC debt. It can be seen in Table 1 that the number of Korean firms raising capital through FC debt represents approximately 45% (2,886 out of 6,460) over the sample period, of which 428 firms use more FC debt financing than LC debt financing and the remaining 2,458 firms use less FC debt than LC debt. Almost 90% of firms using FC debt raise capital through US dollar-denominated debt (2,592 out of 2,886).

4. Empirical Results

4.1. Summary statistics of variables by period

Table 2 presents summary statistics of key variables for three sub-periods as well as for the whole period. Looking first at the debt-related variables, Korean firms on average hold 6.0% of total FC debt (including both financial and operational debt) over the whole sample period, which is higher than 5.2% of total FC assets they own. The average total financial debt ratio (*FD_total*) for a typical Korean firm is 22.6% relative to its total assets, consisting of approximately 3.3% of FC debt *(FCD)* and the remaining 19.3% of LC debt *(LCD)*. Regarding other firm characteristics, Korean firms have on average a Tobin's q ratio (*Q*) slightly less than 1.00, a tangible asset ratio (*TAN*) of 32.7%, an operating margin (*PROFIT*) of 4.2%, an export ratio to sales (*EXPORT*) of 24.9%, a total debt to assets ratio (*LEV*) of 45.3%, and a financial deficit ratio (*DEFICIT*) of 4.5%, relative to total assets. A typical Korean firm also payouts (*DIV*) 18.5% of its earnings as dividends and engages in an intra-group transaction with their foreign subsidiaries ratio (*INTTR*) of 7.3%, relative to sales.

Compared to the pre-global financial crisis period of 2002-2006, Korean firms' FC debt (financial)

ratio *(FCD)* during the post-crisis period of 2010-2012 declined significantly by almost one third (from 3.5% to 2.4%), though their average LC debt ratio remains unchanged during the same period. It is also shown that the mean values of tangible asset ratio (*TAN*), export ratio (*EXPORT*), product diversification index (*DIVER*), total debt to assets ratio (*LEV*) and foreign exchange profits (*FXPROFIT*) decline significantly following the global financial crisis. On the other hand, other firm variables such as firm value (*Q*) measured by Tobin's q ratio, profit margin (*PROFIT*), R&D ratio (*RND*), intra-group transaction ratio (*INTTR*), firm size (*SIZE*), large group affiliation (*CHAEBOL*), and changes in total assets (ΔA) increase significantly following the crisis.

4.2. Difference tests for firms issuing foreign currency versus local currency debt financing

Table 3 shows results from difference-in-means and median tests of several firm characteristics for two test samples of firms with more or less FC debt compared to a control sample of firms with LC debt only. The control sample is constructed by employing the whole sample approach in Panel A and by the matching sample approach in Panel B. The first test sample to be compared to the matching control sample includes firms issuing more FC debt, consisting of both firms using FC debt only and firms whose LC debt is less than 50% of their FC debt. The second test sample includes firms issuing less FC debt, consisting of firms whose FC debt is less than 50% of their LC debt.

As shown in first six columns of Table 3, while more-FC debt firms have on average higher total FC assets (*FCA_total*) and total FC debt (*FCD_total*) ratios,[7] as expected, they have a significantly lower total financial debt ratio (*FD_total*, including both FC and LC financial debt) than firms issuing LC debt only. Firms issuing more FC debt also have more export (*EXPORT*), pay out more earnings as dividends (*DIV*), engage in more intra-group transactions(*INTTR*), and belong to a large business group (*CHAEBOL*). On the other hand, these firms have on average lower firm value, invest less in R&D, are less leveraged, and incur less depreciation expense.

We now turn to the comparison of the second test sample of firms financing less FC debt with

[7] Total FC debt includes both financial and operational short-term and long-term debt.

firms financing LC debt only. Firms using less FC debt have similarities in many aspects of firm characteristics to those using more FC debt (the first test sample), but also exhibit notable differences. For example, unlike those using more FC debt, firms using less FC debt carry more total financial debt (*FD_total*), more tangible assets(*TA*), less dividends(*DIV*), more diversified products(*DIVER*), more experience in global markets(*EXPER*), larger firm size(*SIZE*), higher total leverage(*LEV*), and chaebol-affiliated(*CHAEBOL*). The results from difference tests using firms with LC debt only constructed from the matching sample approach reported in Panel B are qualitatively identical to those reported in Panel A.

The overall results in Table 3 reveal that while the two test samples of firms using FC debt financing reveal similar firm characteristics, the two samples also have several firm attributes vastly different from each other. These differences further validate our analysis of dividing the test sample of firms using FC debt into two subgroups of 'more FC debt' and 'less FC debt' as done in Table 3.

4.3. Pearson correlation coefficients

Before we examine regression results, we perform the analysis of Pearson correlation coefficients among several key variables using the full sample of 6,460 observations over the whole period and report the results in Table 4. On the one hand, a firm's FC debt financing (*FCD*) is significant (at least at the 5% level) positively correlated to tangible assets (*TAN*), export ratio (*EXPORT*), intra-group transactions with foreign subsidiaries (*INTTR*), and firm size (*SIZE*), but significantly negatively to firm value (*Q*), operating margin (*PROFIT*), R&D ratio (*RND*), dividend payout (*DIV*), depreciation ratio (*DEP*), and foreign exchange profit (*FXPROFIT*). Hence, a firm with a higher tangible asset ratio, a higher export ratio, more intra-group transactions, larger size, but with lower value, lower operating profitability, less dividends, less depreciation expense, and/or less FX profit is likely to use more FC debt.

On the other hand, a firm's usage of LC debt is significantly positively correlated with firm value (*Q*), tangible asset ratio (*TAN*), diversification index (*DIV*), firm size (*SIZE*), financial leverage (*LEV*), and financial deficit (*DEFICIT*), but significantly negatively with operating profitability (*PROFIT*), dividend payout (*DIV*), depreciation ratio (*DEP*), and changes in total assets (ΔA). Hence, such firm

characteristics as firm value, export ratio, R&D, product diversification, intra-group transactions, deficit ratio, changes in assets, and FX profit affect the usage of FC debt and LC debt significantly differently or in the opposite direction.

It is also shown that firm value is significantly positively correlated with most firm characteristics such as R&D ratio, product diversification, experience in global capital markets, firm size, leverage, chaebol affiliation, financial deficit, depreciation ratio, and changes in total assets. On the contrary, firm value is significantly negatively correlated with tangible asset ratio, operating profitability, and dividend payout ratio. Most importantly, firm value is negatively correlated to FC debt but positively to LC debt. Though preliminary, these findings offer an interesting but intriguing evidence on the opposite effects of the usage of FC debt versus the usage of LC debt on firm value.

4.4. Regression results on the effect of FC debt financing on firm value

We now turn to regression results on the relationship between a firm's usage of FC debt financing and firm value using the sample firms that are constructed using the matching sample approach. Panel A of Table 5 presents the regression estimates for firms using more FC debt financing (matching sample 1), and Panel B for firms using less FC debt financing (matching sample 2) for the whole period and the three sub-periods. It is worth noting that while the regression models using a substantially more firm-year observations of 4,916 in Panel B show higher F-values, the regression models in Panel A explain the variations of data slightly better as evidenced by slightly higher adjusted R^2 than those in Panel B.

As shown in Panels A and B, the FC debt financing variable (*FC_D*) carries a negative and significant (at the 1% level) regression coefficient for the whole period, regardless of the proportions of FC debt relative to LC debt in the firm's capital structure, indicating that firms using FC debt financing are valued lower than firms using LC debt financing only.

Though not primary issues, it is interesting to note some differences in the effects of firm characteristics on firm value between firms with more FC debt and firms with less FC debt. Among others, a firm's product diversification (*DIVER*) has little valuation effect in Panel A, but is significantly

positively related to firm value in Panel B. Similarly, a firm's operating profitability (*PROFIT*) and affiliation to a large business group (*CHAEBOL*) affect firm value negatively and significantly (at the 1% level) in Panel B, but have little valuation effect in Panel A.

The regression results in Table 5 provide convincing evidence that the usage of FC debt financing does not lead to an increase in firm value. The significant negative valuation effect of the usage of FC debt financing remains unchanged, regardless of the proportion of FC debt relative to LC debt in the firm's capital structure and the appreciation or depreciation of the LC relative to US dollar.

One may still wonder whether the negative valuation effect of FC debt financing is period-specific and limited to a certain short period. In order to examine this issue further, we analyze our sample firms by dividing the sample period into three sub-periods of the pre-GFC period of 2002-2006, the GFC period of 2007-2009, and the post-GFC period of 2010-2012. The regression results are shown in columns three through five in Table 5. While the regression coefficients of *FC_D* vary in terms of magnitude and significance levels, they are all negative and significant at least at the 5% level, regardless of the test sample firms employed in Panels A and B, except for firms using less FC debt during the post-GFC period. Even during the pre-GFC period when the value of LC has gradually increased against US dollar, firms using FC debt financing are shown to be valued significantly (at the 1% level) lower than those using LC debt financing only. Hence, these findings strongly indicate that the negative valuation effect of FC debt financing is not driven by the different level of LC value relative to US dollar but is pervasive across all subperiods surrounding the global financial crisis.

4.5. Robustness tests

In order to ensure the robustness of our empirical results, we perform two robustness tests. Because the main research issue of our paper is the effect of the usage of FC debt financing on firm value, we focus on the robustness tests that deal with this research issue.

The first test we perform is to estimate the regression equation (1) by controlling for a firm's profits and losses associated with changes in exchange rates (*FXPROFIT*). A firm's foreign exchange

profit or loss could have a significant impact on the firm's gross profits and thus firm value.[8] For example, a firm with transactional foreign exchange exposure could suffer a business loss over an extended period of time when exchange rates fluctuate widely. The foreign exchange gains and losses will, however, need to be controlled to gauge the true impact of FC debt financing on firm value as they are non-operating income (or loss) derived from activities not related to the firm's core operations. *FXPROFIT* is measured by the difference between the sum of profits on foreign exchange and gains on FC translation and transaction gains and the sum of losses on foreign exchange and FC translation and transaction losses, divided by sales. As *FXPROFIT* includes both transaction and translation gains (or losses), we also employ two break-down versions of *FXPROFIT*—*FXPROFIT_tsl* and *FXPROFIT_tsa*—for foreign exchange translation and transaction gains (or losses), respectively.

Table 6 presents the regression results from the regression equation (2) with additional variables of *FXPROFIT* in Models (1) and (3) and *FXPROFIT_tsl* and *FXPROFIT_tsa* in Models (2) and (4) for two samples of firms with more FC debt and firms with less FC debt, each matched by firms with LC debt only. Regardless of matching sample firms used, *FC_D* carries a negative and significant regression coefficient at the 1% level in Models (1) through (4). Hence, even with *FXPROFIT* in the regression models as a control for a firm's foreign exchange profit and loss, the significant negative effect of the usage of FC debt financing remains unchanged.

The second robustness test is to estimate regression equation (1) by employing a full sample instead of the matching sample. One of the shortcomings associated with the matching sample approach is the limited number of observations due to the matching procedure. In order to assess whether our main empirical results on the relationship between the usage of FC debt financing and firm value remain unaltered, we estimate regression equation (1) using a total of 6,460 firm-year observations in the full sample and report the regression results in Models (5) and (6) in Table 6. Because the samples in this

[8] For example, a transactional foreign exchange gain or loss arises when a transaction (a sale or a purchase) is recorded in the accounts at the exchange rate at the time of the transaction but payment is made at a different rate. International Accounting Standards require the transaction to be recorded initially using the exchange rate at the date of the transaction and exchange rate gains/losses to be presented as other income or expense in the profit and loss account.

analysis are panel data, we estimate regression equation (1) using the fixed effect panel model to effectively reflect unobserved individual firm effects. In the place of *FC_D* (the indicator variable used in regression equation (1)), we also use a different set of six variables representing the usage of FC and LC debt financing (*FCD and LCD, respectively)* as key test variables.

As shown in Table 6, while there are some variations with regard to the significance levels, *FCD* carries negative and significant (at the 1% level) regression coefficients for the whole period in both Models (5) and (6). *LCD* also has negative and significant (at the 1% level) regression estimates. Hence, a higher level of FC debt financing and/or LC debt financing is associated with a lower firm value. When comparing the regression coefficients of *FCD* and *LCD*, however, the absolute value of the regression coefficient of *FCD* is substantially larger than that of *LCD* by, for example, as much as 19% (= [|-0.641| - |-0.540|]/|-0.540|) in Model (6). These findings indicate a far more negative effect of FC debt financing on firm value than that of LC debt financing on firm value. Hence, the regression results from the full sample are in general consistent with and thus provide confirmatory evidence in supportive of our earlier findings on the negative association of the usage of FC debt financing and firm valu**e**.

Additionally, we estimated Models (5) and (6) using both clustered standard error by firms and the lagged variables of FC and LC debt (FCD_{t-1} and LCD_{t-1}) to control for a possible endogeneity problem. The results from these regression analyses were qualitatively the same as those reported in Table 6.

4.6. *Analysis of potential causes of lower firm values associated with FC debt financing*

As we have documented strong evidence of the negative effect of FC debt financing on firm value, a natural question to follow is what factors contribute to this negative valuation effect of FC debt financing. As shown in Models (1) through (4) in Table 6, even after controlling for the changes in cash flows raised by FC debt financing, the values of firms using FC debt financing are found to be significantly lower than those of firms using LC debt financing. In this section, we investigate two potential causes of this negative association of FC debt financing with firm value—firm risk and cost of hedging.

We first conjecture whether the lower values for firms using FC debt financing is attributable to the increased firm risk associated with the usage of FC debt financing. It is reasonably expected that a firm's FC debt financing would affect both its systematic and unsystematic risk and thus total risk as well due to the change in firm value resulting from a change in foreign exchange rates and the firm's decision to diversify the underlying currencies of its FC debt. To examine this issue, we perform two tests: (1) difference in means and medians tests of firm risk variables between firms using FC debt and firms using LC debt; and (2) regression analyses.

Table 7 reports the results from difference tests for three firm risk variables of total risk (*TRISK*), market risk (*BETA*), and idiosyncratic risk(*IRISK*) using control samples of firms with LC debt only constructed from the matching sample approach[9]. Regardless of the compared sample, all three firm risk variables of firms with more FC debt financing are significantly less than those of firms with LC debt financing only, indicating significantly lower firm risk for firms financing FC debt than firms financing LC debt. In contrast, firms with less FC debt financing carry significantly more total risk (*TRISK)* and market risk (*BETA*) than firms with LC debt only do. While the difference tests offer evidence on the lower firm risk for firms using FC debt than firms using LC debt only, the results are preliminary and incomplete as firm risk is also affected by other firm characteristics. In this regard, we now turn to regression results for the effect of FC debt financing on firm risk.

Models (1) through 4 in Table 8 present the regression results of using *TRISK* as dependent variable, *FC_D* as key test variable, and several control variables including product diversification (*DIVER*), firm size (*SIZE*), financial leverage (*LEV*) and year and industry dummies. Regardless of the matching samples employed, the estimated regression coefficient of *FC_D* is negative and significant at least at the 10% level, with the negative effect of *FC_D* more pronounced for firms using more FC debt financing than those using less FC debt financing. Combined with the results from difference tests, the regression results reject the conjecture that the lower values for firms using FC debt financing than firms

[9] The results from difference tests using the full sample were qualitatively identical to those using the matching sample.

using LC debt are caused by higher firm risk associated with FC debt financing.

In the regression analyses of using *BETA* and *IRISK* as dependent variables, *FC_D* carries a negative and significant (at least at the 10%) regression coefficient in all models except for Model 5. Hence, firms with FC debt financing have both lower market risk due to the hedging effect of FC debt and their firm-specific, idiosyncratic risk. As shown in results using matching sample 2, firms with less FC debt financing (than LC debt financing) exhibit lower total risk (TRISK), even though their market risk mainly caused by changes in foreign exchange rates is greater in spite of the usage of smaller FC debt financing.

Our findings of the lower, not higher, firm risk for firms using FC debt financing may be attributed at least to one of the three potential factors. We discuss these factors with respect to their possible effects on firm value. First, FC debt financing may indeed lead to lower firm risk. Existing studies show that FC debt financing acts as an effective tool for managing foreign exchange risk associated with firms' exports (Keloharju and Niskanen, 2001; Ellot et al., 2003; Kedia and Mosumdar, 2003; Bae and Kwon, 2013). This factor, however, fails to explain our empirical evidence of lower risk and lower value for firms using FC debt financing because the decrease in firm risk from the usage of FC debt financing should lead to a higher firm value for these firms. Second, firms with lower risk may use FC debt financing. As shown in Table 7, firms with less FC debt have significantly higher firm risk (both in total risk and market risk) than firms with LC debt only. These results indicate that the usage of FC debt is also pervasive among firms with high firm risk, rejecting the possible endogeneity issue. Third, firms using FC debt financing may be able to reduce their firm risk by effectively hedging the foreign exchange risk through other hedging tools such as currency derivatives. As Korean firms are known for having frequently employed various hedging tools including derivatives products (see, e.g., Jung and Kwon, 2007), we further examine this third factor in details below.

We conjecture that our evidence of lower risk and lower value for firms using FC debt financing is mainly due to the excessive cost of hedging by these firms. In order to look into the detailed usage of currency derivatives by our sample firms, we have compiled this data in Table 9. As expected, firms with

FC debt engage in more exporting activities than firms with LC debt only, as evidenced by the significantly higher export ratio for the former. Regardless of matching samples employed, significantly more firms with FC debt use currency derivatives than firms with LC debt only do, with about one of every three to four firms with FC debt versus about one of every five to seven firms with LC debt only. The former is also engaged in significantly more transaction amount of currency derivatives than the latter, with more than 4.35% for the former vs. less than 1.18% for the latter, relative to total assets. Among types of currency derivatives, current forwards are most heavily used by all sample firms, representing about 74.0% (= (0.0056 + 0.0266)/0.0435) for firms with more FC debt and about 54.2% (= (0.0017 + 0.0047)/0.0118) for firms with LC debt only in terms of transaction amount relative to total assets. Furthermore, of the currency forwards, short currency forwards are substantially more used than long currency forwards by firms in both samples, and the difference in the usage of short currency forwards between the two sample firms is statistically significant at least at the 5% level regardless of the matching sample.

The findings in Table 9 indicate that Korean firms are more geared to hedge their long positions or receipts of foreign currencies mainly resulting from their exporting activities by taking short positions in current forwards. This strategy of hedging with short currency forwards would be effective and offer protection with the guaranteed pre-determined amount of LC. Otherwise, this strategy would be over-hedged and ineffective.

If a proper hedge is employed, then the effect of managing foreign exchange risk would not be related to the changes in the values of the underlying currency. If a proper hedge is not employed, that is, if the hedge ratio is not optimal, however, the outcome of managing foreign exchange risk may affect firm value based on the changes in currency values.

During the course of our sample period, the LC value gradually increased during the pre-GFC period of 2002-2006 and during the post-GFC period of 2010-2012. However, the LC value declined sharply with significant volatilities during the GFC period of 2007-2009 during which the short currency forwards used by Korean firms would offer little hedging protection but incur substantial costs to them.

A good example is currency KIKO (knock-in knock-out) options, a type of structured forward contracts, which was one of the instruments widely used for hedging exchange rate risk (in particular, against US dollar) in the Korean financial markets until late 2008. It is a well-published incident, known as KIKO disaster, that Korean firms incurred significant financial losses through their purchases of KIKO options.[10] These observations suggest that while the usage of currency derivatives by firms with FC debt financing is able to reduce firm risk, it fails to generate higher firm values due to the excessive costs associated with using hedging tools such as currency derivatives.

In the following section, we analyze whether our sample firms properly use the transactions of currency derivatives for hedging purposes. If a firm's hedging activity using currency derivatives is properly done, then the usage of currency derivatives may be positively related to firm value (Allayannis and Weston, 2001). Accordingly, if a firm uses currency derivatives properly, the degree of the usage of currency derivatives for firms with FC debt would be positively related to firm value, but its usage of currency derivatives would be either negatively or unrelated to firm value otherwise. Furthermore, if a proper hedge is done, the profits or losses themselves resulting from the usage of currency derivatives reported on the financial statements should be significantly related to firm value. Otherwise, the magnitude of the profits or losses from the usage of currency derivatives is expected to be related to a decrease in firm value[11].

Based on this conjecture, we analyze whether firms with FC debt financing properly use currency derivatives by estimating regression equation (1) with two additional interaction variables: *FC_D* x *FCDEV* where *FCDEV* is the currency derivative ratio, measured by a firm's transaction amount of

[10] The KIKO option was designed to offer positive payoffs to the option holder when Korean won moderately appreciates up to a certain predetermined rate against US dollar; in exchange, the option holder was obligated to take negative payoffs when the Korean won value depreciates significantly (see Khil and Suh, 2010). As the Korean won depreciated unexpectedly during the GFC period of 2007-2008, however, the KIKO option incurred substantial losses to the option holders. According to the Korean Financial Services Commission, 519 firms held the KIKO options in the outstanding amount of $10.1 billion, and 68 firms holding overhedged KIKO positions (amounts of KIKO options exceeding their export amounts) reported financial losses of $384 million as of June 2008, which far exceeded financial gains of $142 million from their export revenues in US dollar.

[11] Profit or loss of derivatives represents the portion of an ineffective usage of derivatives for hedging. If a firm uses a proper amount of derivatives, the profit or loss of the derivatives would offset the (opposite) changes in the value of hedged assets, which would have little effect on firm value.

currency derivatives relative to its total assets; and *FC_D* x *DEVPL*, where *DEVPL* is profit/loss ratio of currency derivatives, measured by profits and losses associated with currency derivative transactions relative to total assets.[12]

The results are reported in Table 10. As shown in Models (1) and (3), the regression coefficient of *FC_D* x *FCDEV* is positive but insignificant at the 10% level; hence, the usage of currency derivatives by firms with FC debt financing does not bring in an increase in firm value. These findings indicate that while there is a positive effect of reducing firm risk, the usage of currency derivatives by firms with FC debt financing fails to increase firm value mainly due to the excessive costs of hedging (including contract amount of currency derivatives and other transaction costs) with an increased usage of currency derivatives, relative to the magnitude of exposed risk. As reported in Table 9, firms with FC debt financing use currency derivatives more frequently and in a larger transaction amount than firms with LC debt financing only. This finding implies the possibility that these firms may incur excessive hedging expenses well beyond the natural hedge of FC debt financing against risk exposure from exporting activities. Accordingly, we examine the regression coefficients of the interaction variable of *FC_D* x *DEVPL*. As presented in Models (2) and (4) of Table 10, the estimated regression coefficient carries a negative sign in both Models (2) and (4), and is significant at the 1% level in Model (4) using matching sample 2. These findings suggest the possibility that firms with FC debt financing may fail to maintain an optimal, proper hedge ratio of currency derivatives.

5. Summary and Conclusion

In this paper, we have analyzed the effect of the usage of FC debt financing on firm value, compared to LC debt financing. For this purpose, we select our test sample of firms with FC debt from non-financial firms in Korea from 2002-2012 and construct matching control samples of firms with LC debt. We have also examined this issue for three sub-periods surrounding the global financial crisis, as

[12] Although profit or loss of derivatives reflects the assessed values and transactions of all types of derivatives, the majority of these derivatives used by our sample firms are currency derivatives, whose primary usages are for hedging. Hence, the profit or loss of derivatives can be regarded as the outcome of currency hedges.

well as for the whole period.

Our regression results show that firms using FC debt financing have significantly lower values than those using LC debt financing for the whole sample period, whose evidence is in supportive of the risk aggravation hypothesis of FC debt financing. Even during the pre-crisis period of 2002–2006 when the LC value appreciates, our results show no evidence of an increase in firm value associated with the usage of FC debt financing. We further explore two potential causes of the lower firm values for firms with FC debt financing—firm risk and costs of hedging. The analysis of firm risk reveals that firms with FC debt carry lower, not higher, firm risk than firms with LC debt, thus rejecting our conjecture that the lower values of firms with FC debt are caused by the higher risk resulting from FC debt financing. The analysis of cost of hedging shows that Korean firms with FC debt are indeed engaged in the usage of currency derivatives, especially short currency forwards, more frequently and heavily than firms with LC debt.

It is well documented that a good number of Korean firms incurred significant losses from their usages of currency derivatives contracts including the KIKO options during the global financial crisis. Combined with this observation, our findings suggest that although firms with FC debt carry lower risk than firms with LC debt resulting from the natural hedge of operating risk from their exporting activities and the diversified sources of debt financing, their usages of FC debt financing fail to lead to higher firm values due to the excessive costs of hedging with currency derivatives. Our findings of lower values for firms with FC debt and their excessive costs of hedging as a potential cause are consistent with those in the existing literature. In particular, Allaynnis et al. (2003) show that FC debt hedged through currency derivatives for firms in emerging markets in the Asia hurts their operating and financial performances due to the underdeveloped derivatives markets in these countries. Similarly, Clark and Judge (2009) find that the reason for failing to relate FC debt to an increase in firm value is due to many constraints accompanying the management of foreign exchange risk using FC debt. Overall, the results of our paper suggest that while a firm's proper usage of currency derivatives in conjunction with FC debt helps reduce the firm's exchange rate exposure, as Geczy et al. (1997) demonstrate, a firm's failure to do so would hurt

its operating and financial performances and thus deteriorate firm value.

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Table 1. Distribution of sample firms by year and type of currency on debt

Year	Whole sample	FC debt	LC debt	More FC debt	Less FC debt	LC debt only	No debt	USD debt Only	USD & non-USD debt	Non-USD debt only
2002	543	289	503	31	258	221	33	145	119	25
2003	557	296	507	37	259	219	42	153	112	31
2004	560	282	490	41	241	219	59	148	103	31
2005	576	278	502	44	234	234	64	148	99	31
2006	576	281	494	40	241	218	77	153	97	31
2007	590	283	504	37	246	226	81	170	84	29
2008	606	301	532	52	249	243	62	184	88	29
2009	604	288	526	45	243	253	63	166	87	35
2010	611	272	522	47	225	273	66	156	85	31
2011	610	158	549	26	132	398	54	76	74	8
2012	627	158	543	28	130	395	74	71	74	13
Total	6,460	2,886	5,672	428	2,458	2,899	675	1,570	1,022	294

Notes: FC = foreign currency. LC = local currency. USD = US dollar. Firms with more FC debt includes firms with FC debt only and firms using substantially more FC debt than LC debt in such a way that a firm's FC debt is more than two times of its LC debt. Firms with less FC debt include firms with substantially less FC debt than LC debt in such a way that a firm's FC debt is less than two times of LC debt).

Table 2. Summary statistics and difference tests of variables by period

	Whole Period (2002-2012) (N=6,460)		Pre-GFC (2002~2006) (N=2,812)		GFC (2007~2009) (N=1,800)		Post-GFC (2010~2012) (N=1,848)		Difference Tests (Post-GFC – Pre-GFC)	
Variables	Mean	Median	Mean	Median	Mean	Median	Mean	Median	t-stat	z-stat
FCA_total_t	0.052	0.017	0.049	0.017	0.053	0.019	0.055	0.014	2.37 **	-2.43 **
FCD_total_t	0.060	0.021	0.061	0.023	0.064	0.026	0.055	0.013	-2.38 **	-5.31 ***
FD_total_t	0.226	0.212	0.231	0.214	0.222	0.209	0.222	0.208	-1.69 *	-1.49
Q_t	0.989	0.868	0.931	0.825	1.032	0.895	1.033	0.903	6.95 ***	8.58 ***
FCD_t	0.033	0.000	0.035	0.000	0.038	0.000	0.024	0.000	-6.39 ***	-11.57 ***
LCD_t	0.193	0.173	0.196	0.172	0.184	0.160	0.198	0.182	0.56	0.54
TA_t	0.327	0.317	0.355	0.346	0.316	0.310	0.294	0.285	-10.73 ***	-10.22 ***
$PROFIT_t$	0.042	0.046	0.034	0.047	0.033	0.046	0.061	0.044	6.23 ***	-0.06
$EXPORT_t$	0.249	0.087	0.282	0.155	0.265	0.104	0.184	0.010	-11.22 ***	-15.32 ***
RND_t	0.015	0.004	0.012	0.004	0.016	0.005	0.016	0.003	5.37 ***	-2.12 **
DIV_t	0.185	0.120	0.195	0.135	0.164	0.103	0.189	0.113	-0.76	-1.84 *
$DIVER_t$	0.202	0.001	0.234	0.035	0.230	0.041	0.125	0.000	-12.08 ***	-15.45 ***
$INTTR_t$	0.073	0.000	0.067	0.000	0.079	0.001	0.075	0.000	1.57	3.75 ***
$EXPER_t$	0.046	0.000	0.044	0.000	0.048	0.000	0.048	0.000	0.56	0.56
$SIZE_t$	19.387	19.042	19.083	18.759	19.482	19.124	19.757	19.406	14.28 ***	14.98 ***
LEV_t	0.453	0.458	0.469	0.469	0.445	0.456	0.438	0.440	-5.13 ***	-4.86 ***
$CHAEBOL_t$	0.235	0.000	0.213	0.000	0.250	0.000	0.252	0.000	3.12 ***	3.11 ***
$DEFICIT_t$	0.045	0.033	0.045	0.033	0.051	0.035	0.041	0.032	-0.94	0.30
DEP_t	0.006	0.003	0.006	0.003	0.006	0.003	0.006	0.002	-1.58	-7.64 ***
$\triangle A_t$	0.033	0.049	0.009	0.030	0.058	0.075	0.046	0.056	6.62 ***	8.00 ***
$FXPROFIT_t$	0.000	0.000	0.001	0.000	-0.002	0.000	0.000	0.000	-4.51 ***	-4.20 ***

Notes: See Appendix for definitions and measurement of variables.

Table 3. Difference tests of variables for firms financing foreign currency and local currency debt

Panel A. firms financing FCdebt vs. firms financing LCdebt only (Whole sample approach)

	Firms with more FC debt (N=428) (1)		Firms with less FC debt (N=2,458) (2)		Firms with LC debt only (N=2,899) (3)		Difference tests (1) – (3)		Difference tests (2) – (3)	
Variables	Mean	Median	Mean	Median	Mean	Median	t-stat	z-stat	t-stat	z-stat
FCA_total_t	0.078	0.034	0.062	0.031	0.042	0.007	8.12***	11.35***	8.89***	18.85***
FCD_total_t	0.172	0.141	0.097	0.070	0.023	0.001	41.12***	29.37***	35.09***	46.27***
FD_total_t	0.157	0.124	0.311	0.303	0.217	0.195	-7.56***	-7.28***	21.86***	21.38***
Q_t	0.860	0.731	0.967	0.871	1.007	0.881	-5.68***	-7.65***	-3.12***	-0.03
FCD_t	0.130	0.114	0.064	0.042	0.000	0.000	70.68***	57.49***	51.97***	68.86***
LCD_t	0.027	0.007	0.247	0.233	0.217	0.195	-24.86***	-27.47***	7.26***	8.68***
TA_t	0.319	0.302	0.369	0.368	0.311	0.298	0.78	1.18	11.31***	11.43***
$PROFIT_t$	0.042	0.043	0.033	0.040	0.034	0.046	0.83	-0.94	-0.34	-3.25***
$EXPORT_t$	0.350	0.273	0.313	0.242	0.194	0.026	10.46***	10.04***	14.85***	17.53***
RND_t	0.009	0.002	0.013	0.004	0.016	0.004	-5.42***	-5.24***	-4.90***	0.03
DIV_t	0.204	0.145	0.168	0.100	0.179	0.113	1.83*	3.28***	-1.62	-2.16**
$DIVER_t$	0.190	0.005	0.231	0.025	0.194	0.000	-0.30	0.88	4.21***	5.29***
$INTTR_t$	0.094	0.009	0.086	0.004	0.063	0.000	3.74***	6.75***	5.00***	10.52***
$EXPER_t$	0.037	0.000	0.068	0.000	0.037	0.000	0.08	0.08	5.16***	5.14***
$SIZE_t$	19.334	18.998	19.620	19.203	19.275	18.964	0.72	0.60	7.76***	7.28***
LEV_t	0.370	0.339	0.534	0.533	0.451	0.447	-8.18***	-8.56***	16.31***	15.90***
$CHAEBOL_t$	0.250	0.000	0.265	0.000	0.215	0.000	1.65*	1.65	4.32***	4.31***
$DEFICIT_t$	0.036	0.034	0.039	0.034	0.052	0.033	-2.11**	-0.64	-3.41***	-0.90
DEP_t	0.003	0.002	0.004	0.002	0.007	0.003	-6.36***	-5.42***	-9.94***	-7.63***
$\triangle A_t$	0.050	0.049	0.038	0.047	0.031	0.050	1.71*	0.05	1.34	-0.64
$FXPROFIT_t$	0.000	0.001	-0.001	0.000	0.000	0.000	0.88	7.30***	-1.16	4.65***

Panel B. firms financing FCdebt vs. firms financing LCdebt only (Matching sample approach)

	Matching sample 1				Matching sample 2							
	Firm with more FC debt		Matching firms with LC debt only		Firms with less FC debt		Matching firms with LC debt only		Difference tests		Difference tests	
	(N=428) (1)		(N=428) (2)		(N=2,458) (3)		(N=2,458) (4)		(1) – (2)		(3) – (4)	
Variables	Mean	Median	Mean	Median	Mean	Median	Mean	Median	t-stat	z-stat	t-stat	z-stat
FCA_total_t	0.078	0.034	0.048	0.016	0.062	0.031	0.042	0.011	4.48***	5.58***	9.10***	14.22***
FCD_total_t	0.172	0.141	0.023	0.003	0.097	0.070	0.022	0.002	22.09***	21.64***	34.12***	43.93***
FD_total_t	0.157	0.124	0.193	0.161	0.311	0.303	0.225	0.210	-3.84***	-3.44***	19.26***	18.60***
Q_t	0.860	0.731	1.010	0.834	0.967	0.871	1.025	0.893	-4.20***	-4.70***	-4.40***	-1.63
FCD_t	0.130	0.114	0.000	0.000	0.064	0.042	0.000	0.000	27.14***	27.07***	47.86***	64.91***
LCD_t	0.027	0.007	0.193	0.161	0.247	0.233	0.225	0.210	-22.66***	-20.09***	5.13***	6.01***
TA_t	0.319	0.302	0.338	0.321	0.369	0.368	0.349	0.345	-1.58	-1.18	3.92***	3.87***
$PROFIT_t$	0.042	0.043	0.053	0.049	0.033	0.040	0.041	0.048	-1.07	-1.12	-1.93*	-4.57***
$EXPORT_t$	0.350	0.273	0.243	0.086	0.313	0.242	0.230	0.070	4.99***	4.55***	9.88***	10.45***
RND_t	0.009	0.002	0.010	0.004	0.013	0.004	0.015	0.005	-1.37	-2.37**	-2.75**	-1.25
DIV_t	0.204	0.145	0.196	0.123	0.168	0.100	0.177	0.119	0.47	1.08	-1.23	-2.62**
$DIVER_t$	0.190	0.005	0.195	0.000	0.231	0.025	0.223	0.027	-0.26	0.53	0.86	0.52
$INTTR_t$	0.094	0.009	0.071	0.000	0.086	0.004	0.060	0.000	1.99*	2.88***	5.83***	7.41***
$EXPER_t$	0.037	0.000	0.016	0.000	0.068	0.000	0.040	0.000	1.90*	1.90*	4.31***	4.30***
$SIZE_t$	19.334	18.998	19.177	18.848	19.620	19.203	19.373	18.984	1.53	1.54	5.39***	5.19***
LEV_t	0.370	0.339	0.396	0.373	0.534	0.533	0.457	0.455	-2.08**	-2.51**	15.55***	14.94***
$CHAEBOL_t$	0.250	0.000	0.196	0.000	0.265	0.000	0.245	0.000	1.89*	1.89*	1.57	1.57
$DEFICIT_t$	0.036	0.034	0.066	0.035	0.039	0.034	0.056	0.038	-3.07***	-0.86	-4.11***	-2.23**
DEP_t	0.003	0.002	0.008	0.003	0.004	0.002	0.008	0.003	-6.58***	-5.11***	-10.08***	-9.72***
$\triangle A_t$	0.050	0.049	0.056	0.061	0.038	0.047	0.048	0.055	-0.47	-1.47	-1.67*	-2.45**
$FXPROFIT_t$	0.000	0.001	-0.001	0.000	-0.001	0.000	0.000	0.000	1.22	5.79***	-0.99	5.28***

Notes: See Appendix for definitions and measurement of variables.

Table 4. Pearson correlation coefficients of select key variables

Variable		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
FCD_t	(1)	1.00																	
LCD_t	(2)	0.01	1.00																
Q_t	(3)	-0.04 [a]	0.05 [a]	1.00															
TA_t	(4)	0.10 [a]	0.16 [a]	-0.11 [a]	1.00														
$PROFIT_t$	(5)	-0.07 [a]	-0.19 [a]	-0.04 [a]	-0.08 [a]	1.00													
$EXPORT_t$	(6)	0.18 [a]	0.00	-0.01	0.03 [a]	-0.10 [a]	1.00												
RND_t	(7)	-0.10 [a]	-0.01	0.25 [a]	-0.11 [a]	-0.13 [a]	0.01	1.00											
DIV_t	(8)	-0.05 [a]	-0.16 [a]	-0.05 [a]	-0.02	0.18 [a]	-0.05 [a]	-0.04 [a]	1.00										
$DIVER_t$	(9)	-0.02	0.05 [a]	0.03 [a]	-0.02	-0.06 [a]	0.03 [a]	0.04 [a]	-0.01	1.00									
$INTTR_t$	(10)	0.07 [a]	-0.02	0.00	-0.11 [a]	-0.05 [a]	0.43 [a]	0.08 [a]	0.02	-0.01	1.00								
$EXPER_t$	(11)	0.02	-0.01	0.10 [a]	0.08 [a]	0.04 [a]	0.06 [a]	0.09 [a]	0.01	-0.01	0.11 [a]	1.00							
$SIZE_t$	(12)	0.04 [a]	0.05 [a]	0.33 [a]	0.05 [a]	0.25 [a]	0.05 [a]	0.05 [a]	0.05 [a]	0.05 [a]	0.03 [a]	0.46 [a]	1.00						
LEV_t	(13)	0.24 [a]	0.74 [a]	0.13 [a]	0.14 [a]	-0.26 [a]	0.08 [a]	-0.06 [a]	-0.19 [a]	0.05 [a]	-0.05 [a]	0.02	0.17 [a]	1.00					
$CHAEBOL_t$	(14)	0.01	0.02	0.17 [a]	0.04 [a]	0.14 [a]	0.03 [a]	-0.03 [a]	0.04 [a]	0.09 [a]	-0.02	0.32 [a]	0.64 [a]	0.10 [a]	1.00				
$DEFICIT_t$	(15)	-0.02	0.03 [a]	0.17 [a]	-0.04 [a]	-0.25 [a]	0.04 [a]	0.06 [a]	-0.04 [a]	0.01	0.02	0.01	-0.03 [a]	0.01	-0.02	1.00			
DEP_t	(16)	-0.12 [a]	-0.04 [a]	0.11 [a]	0.06 [a]	-0.11 [a]	-0.21 [a]	0.10 [a]	0.03 [a]	-0.06 [a]	-0.05 [a]	0.09 [a]	0.03 [a]	-0.09 [a]	0.09 [a]	0.04 [a]	1.00		
$\triangle A_t$	(17)	0.01	-0.07 [a]	0.08 [a]	-0.01	0.21 [a]	0.00	0.00	0.08 [a]	0.00	-0.04 [a]	0.02	0.19 [a]	-0.05 [a]	0.06 [a]	0.19 [a]	-0.05 [a]	1.00	
$FX\ PROFIT_t$	(18)	-0.04 [a]	-0.02	-0.01	0.03 [a]	0.04 [a]	0.00	-0.02	0.02	0.00	-0.02	0.01	0.02	-0.02	0.00	0.01	-0.03 [a]	-0.01	1.00

Notes: The sample consists of 6,460 firm-year observations of firms financing FC and LC debt during 2002-2012. See Appendix for definitions and measurements of variables. [a] denotes significance at least at the 5% level.

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Table 5. The effect of foreign currency debt financing on firm value by period

Variables	Dependent variable = Q_t			
	Whole period (2002-2012)	Pre-GFC (2002-2006)	GFC (2007-2009)	Post-GFC (2010-2012)
Panel A. Firms using more FC debt financing vs. firms using LC debt financing only (matching sample 1)				
Constant	-1.968*** (-6.04)	-1.939*** (-3.51)	-1.892*** (-4.94)	-2.338*** (-3.80)
FC_D_t	-0.151*** (-4.69)	-0.162*** (-3.19)	-0.143*** (-3.05)	-0.162** (-2.22)
$PROFIT_t$	-0.228 (-0.99)	-1.015* (-1.67)	0.006 (0.03)	-0.182 (-0.41)
$EXPORT_t$	-0.161*** (-2.80)	-0.209** (-2.48)	-0.186** (-2.20)	-0.028 (-0.21)
RND_t	2.087* (1.64)	2.078 (0.80)	4.677** (2.35)	-1.129 (-0.62)
DIV_t	-0.182*** (-3.39)	-0.203** (-2.22)	-0.025 (-0.28)	-0.290*** (-2.61)
$DIVER_t$	0.078 (1.09)	0.165 (1.57)	-0.187** (-2.51)	0.391* (1.71)
$INTTR_t$	0.269** (2.33)	0.456** (2.53)	0.328** (2.37)	-0.100 (-0.63)
$SIZE_t$	0.155*** (8.71)	0.159*** (4.86)	0.144*** (6.58)	0.185*** (5.18)
LEV_t	0.229** (2.38)	0.276** (2.05)	0.381*** (2.52)	-0.130 (-0.57)
$CHAEBOL_t$	-0.069 (-1.40)	-0.028 (-0.33)	-0.035 (-0.56)	-0.270** (-2.39)
IND, YEAR Dummies	Yes	Yes	Yes	Yes
No. of obs.	856	386	268	202
F-value	9.23***	5.62***	8.44***	6.62***
Adjusted R^2	0.2642	0.3311	0.3629	0.1759
Panel B. Firms using less FC debt financing vs. firms using LC debt financing only (matching sample 2)				
Constant	-0.860*** (-8.04)	-0.568*** (-4.34)	-1.128*** (-6.16)	-1.351*** (-4.47)
FC_D_t	-0.097*** (-8.36)	-0.092*** (-6.11)	-0.155*** (-7.05)	-0.038 (-1.36)
$PROFIT_t$	-0.192*** (-2.74)	-0.456*** (-3.63)	-0.125 (-1.32)	0.189 (1.07)
$EXPORT_t$	-0.079*** (-3.42)	-0.142*** (-4.79)	-0.102** (-2.18)	0.036 (0.66)
RND_t	2.547*** (6.52)	2.520*** (4.13)	2.126*** (3.74)	3.547*** (4.15)
DIV_t	-0.168*** (-7.21)	-0.172*** (-7.16)	-0.262*** (-5.75)	-0.081 (-1.35)
$DIVER_t$	0.053** (2.40)	0.077*** (3.02)	0.073* (1.64)	-0.028 (-0.47)
$INTTR_t$	0.054 (1.31)	0.218*** (3.68)	-0.020 (-0.26)	-0.094 (-1.04)
$SIZE_t$	0.092*** (15.50)	0.080*** (10.33)	0.108*** (10.48)	0.117*** (7.17)
LEV_t	0.307*** (8.19)	0.374*** (7.13)	0.328*** (4.96)	0.149* (1.68)
$CHAEBOL_t$	-0.051*** (-2.73)	-0.044* (-1.92)	-0.045 (-1.33)	-0.103** (-2.01)
IND, YEAR Dummies	Yes	Yes	Yes	Yes
No. of obs.	4,916	2,466	1,476	974
F-value	35.49***	25.12***	19.58***	12.94***
Adjusted R^2	0.2543	0.2795	0.2851	0.1921

Notes: The sample in Panel A consists of a total of 856 firm-year observations for the whole period of 2002-2012 including 428 firm-year observations of firms using more FC debt financing and 428 firm-year observations of matching firms using LC debt financing only with similar firm characteristics. The sample in Panel B consists of a total of 4,916 firm-year observations for the whole period of 2002-2012 including 2,458 firm-year observations of firms using less FC debt financing and 2,458 firm-year observations of matching firms using LC debt financing only with similar firm characteristics. The dependent variable is *Q* (firm value), measured by Tobin's q ratio. See Appendix for definitions and measurements of variables. t-statistics are in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% levels.

Table 6. Robustness tests on the effect of foreign currency debt financing on firm value

Variables	*Dependent variable = Q_t*											
	Matching sample 1				Matching sample 2				Full sample (FE panel)			
	Model (1)		Model (2)		Model (3)		Model (4)		Model (5)		Model (6)	
Constant	-1.973***	(-6.06)	-1.979***	(-6.08)	-0.866***	(-8.10)	-0.868***	(-8.15)	-7.488***	(-14.14)	-7.577***	(-14.21)
FC_D_t	-0.150***	(-4.67)	-0.150***	(-4.66)	-0.098***	(-8.39)	-0.098***	(-8.39)				
FCD_t									-0.279**	(-2.40)	-0.641***	(-4.93)
LCD_t											-0.540***	(-5.84)
$FXPROFIT_t$	-1.145	*(-1.42)*			-0.878**	(-2.21)						
$FXPROFIT\_tsl_t$			-0.695	(-0.58)			-1.007*	(-2.21)				
$FXPROFIT\_tsa_t$			-2.131*	(-1.95)			-1.281**	(-2.30)				
$PROFIT_t$	-0.221	(-0.96)	-0.220	(-0.95)	-0.185***	(-2.62)	-0.186***	(-2.66)	-0.068	(-1.18)	-0.057	(-1.00)
$EXPORT_t$	-0.159***	(-2.77)	-0.159***	(-2.77)	-0.078***	(-3.37)	-0.078***	(-3.39)	-0.082**	(-2.16)	-0.099***	(-2.66)
RND_t	2.058	(1.61)	2.051	(1.61)	2.533***	(6.44)	2.534***	(6.44)	1.054	(1.57)	1.176*	(1.78)
DIV_t	-0.181***	(-3.38)	-0.181***	(-3.38)	-0.168***	(-7.23)	-0.168***	(-7.22)	-0.039***	(-2.68)	-0.039**	(-2.63)
$DIVER_t$	0.077	(1.08)	0.078	(1.09)	0.053**	(2.40)	0.053**	(2.41)	-0.021	(-0.80)	-0.026	(-1.02)
$INTTR_t$	0.265**	(2.32)	0.262**	(2.31)	0.052	(1.27)	0.051	(1.27)	-0.126**	(-2.22)	-0.110**	(-1.91)
$SIZE_t$	0.156***	(8.74)	0.156***	(8.76)	0.093***	(15.57)	0.093***	(15.59)	0.437***	(15.86)	0.440***	(15.89)
LEV_t	0.221**	(2.30)	0.224**	(2.32)	0.307***	(8.20)	0.306***	(8.19)	-0.186**	(-2.41)	0.154	(1.45)
$CHAEBOL_t$	-0.070	(-1.43)	-0.073	(-1.47)	-0.052***	(-2.77)	-0.052***	(-2.78)	-0.035	(-1.12)	-0.033	(-1.12)
IND,YEAR dummies	Yes		Yes		Yes		Yes		Yes		Yes	
No. of obs.	856		856		4,916		4,916		6,460		6,460	
F-value / Adj.R^2	8.98*** / 0.2646		8.85*** / 0.2643		34.95*** / 0.2548		34.28*** / 0.2550		27.68*** / 0.4192		27.55*** / 0.4303	

Notes: All regression models are estimated for the whole period of 2002-2012. The sample in matching sample 1 consists of a total of 856 firm-year observations including 428 firm-year observations of firms using more FC debt financing and 428 firm-year observations of matching firms using LC debt financing only with similar firm characteristics. The sample in matching sample 2 consists of a total of 4,916 firm-year observations for the whole period of 2002-2012 including 2,458 firm-year observations of firms using less FC debt financing and 2,458 firm-year observations of matching firms using LC debt financing only with similar firm characteristics. The dependent variable is *Q* (firm value), measured by Tobin's q ratio. *FXPROFIT* represents the sum of *FXPROFIT_tsa* and *FXPROFIT_tsl* . *FXPROFIT_tsl* represents a firm's FX profits or losses on FC translation, measured by the difference between the sum of FX profits and FC translation gains and the sum of FX losses and FC translation losses, divided by total assets. *FXPROFIT_tsa* represents a firm's FX profits or losses on FC transaction, measured by the difference between the sum of FX profits and FC transaction gains and the sum of FX losses and FC transaction losses, divided by sales. See Appendix for definitions and measurements of other variables. t-statistics are in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% levels.

Table 7. Difference tests of firm risk variables for firms using foreign vs. local currency debt financing

	Matching sample 1				Matching sample 2							
	Firm with more FC debt		Matching firms with LC debt only		Firms with less FC debt		Matching firms with LC debt only		Difference tests		Difference tests	
	(N=428) (1)		(N=428) (2)		(N=2,458) (3)		(N=2,458) (4)		(1) – (2)		(3) – (4)	
Variables	Mean	Median	Mean	Median	Mean	Median	Mean	Median	t-stat	z-stat	t-stat	z-stat
$TRISK_t$	1.005	0.997	1.100	1.072	1.142	1.142	1.119	1.118	-3.75***	-3.57***	2.20**	2.45**
$BETA_t$	0.652	0.616	0.707	0.680	0.777	0.765	0.711	0.690	-2.23**	-2.38**	6.48***	6.34***
$IRISK_t$	0.027	0.025	0.030	0.027	0.030	0.028	0.030	0.027	-4.05***	-3.38**	-0.28	1.95*

Notes: *TRISK* = a firm's total risk, measured by the natural logarithm of standard deviations of daily stock returns; *BETA* = market risk, measured by the market model using daily stock and KOSPI returns; *IRISK* = idiosyncratic risk, measured by the standard deviation of daily abnormal returns estimated by the CAPM. See Appendix for definitions and measurements of variables. ***, **, and * denote significance at the 1%, 5%, and 10% levels.

Table 8. Regression analysis of effect of foreign currency debt financing on firm risk

	Dependent variable						*Dependent variable*					
	$TRISK_t$		$BETA_t$		$IRISK_t$		$TRISK_t$		$BETA_t$		$IRISK_t$	
	Matching sample 1						Matching sample 2					
Variables	Model (1)		Model (2)		Model (3)		Model (4)		Model (5)		Model (6)	
Constant	1.505***	(8.63)	-0.939***	(-5.20)	0.062***	(12.380)	1.754***	(28.97)	-0.850***	(-12.83)	0.068***	(-35.06)
FC_D_t	-0.077***	(-3.37)	-0.063***	(-2.82)	-0.002***	(-3.433)	-0.016*	(-1.79)	0.035***	(3.86)	-0.001***	(-4.20)
$DIVER_t$	-0.016	(-0.30)	0.027	(0.61)	-0.001	(-0.460)	0.065***	(4.18)	0.066***	(4.12)	0.001**	(2.18)
$SIZE_t$	-0.041***	(-5.03)	0.077***	(8.55)	-0.002***	(-8.882)	-0.059***	(-22.19)	0.070****	(22.12)	-0.003****	(-30.99)
LEV_t	0.465***	(7.03)	0.187***	(2.63)	0.014***	(6.703)	0.696***	(26.84)	0.172***	(6.54)	0.024***	(25.62)
IND,YEAR dummies	Yes		Yes		Yes		Yes		Yes		Yes	
No. of obs.	856		856		856		4,916		4,916		4,916	
F-value / Adj.R^2	10.00***/ 0.1963		9.50***/ 0.2237		11.07***/ 0.1799		71.30***/ 0.2946		50.31***/ 0.2454		60.30***/ 0.2843	

Notes: The sample for Models (1) and (2) consists of 856 firm-year observations for the 2002-2012 period including 428 observations of firms using more FC debt financing and 428 observations of matching firms using LC debt financing only with similar firm characteristics. The sample for Models (3) and (4) consists of 4,916 firm-year observations for the 2002-2012 period including 2,458 observations of firms using less FC debt financing and 2,458 observations of matching firms using LC debt financing only with similar firm characteristics. *TRISK* (total risk), measured by the natural logarithm of standard deviations of daily stock returns. *BETA* (market risk) measured by the market model using daily stock and KOSPI returns. *IRISK* (idiosyncratic risk) measured by the standard deviation of daily abnormal returns estimated by the CAPM. See Appendix for definitions and measurements of other variables. t-statistics are in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% levels.

Table 9. Usage of currency derivatives and profit/loss of derivatives by firms with foreign vs. local currency debt financing

Variables	Definitions	Matching sample 1		Matching sample 2		Difference tests	
		Firm with more FC debt	Matching firms with LC debt only	Firms with less FC debt	Matching firms with LC debt only	(1) – (2)	(3) – (4)
		(1)	(2)	(3)	(4)		
		Mean	Mean	Mean	Mean	t-stat	t-stat
$EXPORT_t$	*Export ratio*	0.3504 (N=428)	0.2426 (N =428)	0.3128 (N =2,458)	0.2299 (N=2,458)	4.992***	9.875***
$FCDEV_t$	*Transaction amount of currency derivatives relative to total assets*	0.0435 (N=374)	0.0118 (N=374)	0.0339 (N=2,196)	0.0125 (N=2,196)	4.017***	8.909***
- *Long currency forwards*		0.0056	0.0017	0.0045	0.0014	3.133***	5.887***
- *Short currency forwards*		0.0266	0.0047	0.0137	0.0037	3.432***	6.297***
- *Long currency futures*		0.0000	0.0000	0.0000	0.0000	- -	2.516***
- *Short currency futures*		0.0000	0.0001	0.0001	0.0000	-1.019	0.786
- *Long foreign exchange risk insurance*		0.0000	0.0000	0.0000	0.0000	- -	- -
- *Short foreign exchange risk insurance*		0.0002	0.0000	0.0002	0.0002	1.463	0.170
- *Total currency options*		0.0066	0.0029	0.0070	0.0043	1.104	1.925*
- *Total currency swaps*		0.0045	0.0023	0.0084	0.0029	1.439	8.594***
Proportion of firms engaging in transactions of currency derivatives		0.3235 (N =374)	0.1337 (N=374)	0.3588 (N=2,196)	0.1762 (N=2,196)	6.338***	13.966***
$DEVPL_t$	*Profit and Loss of derivatives relative to sales*	-0.0006 (n=428)	-0.0008 (n=428)	-0.0016 (n=2,458)	-0.0009 (n=2,458)	0.246	-1.546

Notes: The sample consists of firm-year observations during 2002-2012 (*EXPORT = export ratio)*, 2002-2010 (*FCDEV = currency derivatives)*, 2002-2012 (*DEVPL = profit and loss of derivatives)*, respectively, by availability of sample. The usage of currency derivatives represents all transactions of currency derivatives but excludes buy and sell transactions for profit purposes. All currency derivatives are measured as relative to total assets. Export ratio and Profit and Loss of derivatives are measured as relative to sales. ***, **, and * denote significance at the 1%, 5%, and 10% levels.

Table 10. Regression analysis on the effect of the usage of currency derivatives and profit/loss of derivatives on firm value

Variables	*Dependent variable = Q_t*							
	Matching sample 1				Matching sample 2			
	Model (1)		Model (2)		Model (3)		Model (4)	
Constant	-1.833***	(-5.19)	-1.972***	(-6.04)	-1.007***	(-9.99)	-0.862***	(-8.06)
FC_D $_t$	-0.161***	(-4.66)	-0.152***	(-4.68)	-0.120***	(-9.80)	-0.099***	(-8.45)
FCDEV $_t$	-0.139	(-0.54)			-0.087	(-0.60)		
FC_D $_t$ x *FCDEV* $_t$	0.365	(1.29)			0.218	(1.39)		
DEVPL $_t$			0.004	(0.16)			0.019***	(4.18)
FC_D $_t$ x *DEVPL* $_t$			-0.010	(-0.34)			-0.019***	(-3.50)
PROFIT $_t$	-0.189	(-0.82)	-0.235	(-0.98)	-0.220***	(-3.05)	-0.209***	(-3.02)
EXPORT $_t$	-0.242***	(-3.98)	-0.162***	(-2.80)	-0.100***	(-4.07)	-0.079***	(-3.41)
RND $_t$	2.474*	(1.76)	2.099*	(1.66)	2.426***	(5.76)	2.528***	(6.49)
DIV $_t$	-0.180***	(-3.07)	-0.181***	(-3.37)	-0.192***	(-9.24)	-0.169***	(-7.23)
DIVER $_t$	0.053	(0.77)	0.078	(1.10)	0.058***	(2.68)	0.053**	(2.40)
INTTR $_t$	0.368***	(2.80)	0.267**	(2.31)	0.081*	(1.92)	0.056	(1.36)
SIZE $_t$	0.147***	(7.35)	0.155***	(8.67)	0.092***	(15.68)	0.093***	(15.57)
LEV $_t$	0.320***	(3.25)	0.226**	(2.31)	0.349**	(8.87)	0.303***	(8.13)
CHAEBOL $_t$	-0.025	(-0.47)	-0.070	(-1.41)	-0.043**	(-2.34)	-0.052***	(-2.77)
IND,YEAR dummies	Yes		Yes		Yes		Yes	
No. of obs.	748		856		4,392		4,916	
F-value	9.09***		8.77***		34.39***		34.33***	
Adjusted R^2	0.2810		0.2625		0.2765		0.2551	

Notes: The sample in matching sample 1 consists of a total of 748 (856) firm-year observations for the whole period of 2002-2010 (2002-2012) including 374 (428) firm-year observations of firms using more FC debt financing and 374 (428) firm-year observations of matching firms using LC debt financing only with similar firm characteristics. The sample in matching sample 2 consists of a total of 4,392 (4,916) firm-year observations for the whole period of 2002-2010 (2002-2012) including 2,196 (2,458) firm-year observations of firms using less FC debt financing and 2,196 (2,458) firm-year observations of matching firms using LC debt financing only with similar firm characteristics. The dependent variable is *Q* (firm value), measured by Tobin's q ratio. *FCDEV* is measured by transaction amount of currency derivatives relative to total assets. *DEVPL* is measured by profit and loss of derivatives relative to total assets. See Appendix for definitions and measurements of other variables. t-statistics are in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% levels.

Appendix. Definitions and measurements of variables

Variables	Definitions	Measurement
FC (financial) debt-related variables		
FCA_total_t	Total FC assets ratio in t	FC assets in t / total assets in t
FCD_total_t	Total FC debt ratio in t	FC debt in t / total assets in t
FD_total_t	Total (financial) debt ratio in t	Total financial debt in t / total assets in t
Regression variables		
Q_t	Firm value in t	Tobin's q ratio = (MVs of common and preferred stock + BV of debt) in t / total assets in t
FC_D_t	FC (financial) debt dummy	1 for a firm using FC (financial) debt financing and 0 for a matching firm using LC (financial) debt financing.
FCD_t	FC (financial) debt ratio in t	FC financial debt in t / total assets in t
LCD_t	LC (financial) debt ratio in t	LC financial debt in t / total assets in t
TA_t	Tangible asset ratio in t	Tangible assets in t / total assets in t
$PROFIT_t$	Profitability ratio in t	Operating margin = operating income in t / sales in t
$EXPORT_t$	Export ratio in t	Exporting amount in t / sales in t
RND_t	R&D ratio in t	R&D expenses in t / sales in t
DIV_t	Dividend payout in t	Dividend amount in t / net income in t
$DIVER_t$	Product diversification in t	Caves' diversification index
$INTTR_t$	Related-party transactions with foreign subsidiaries in t	Related-party transaction amounts with foreign subsidiaries (sum of sales, purchases, profits and costs) in t / sales in t
$EXPER_t$	Experience in global capital markets in t	1 if a firm has experience in issuing deposit receipts (or global receipts) in t and 0 otherwise
$SIZE_t$	Firm size in t	ln(sum of MVs of common and preferred stock + BV of debt in t)
LEV_t	Total debt ratio in t	Total debt (financial and operational) in t / total assets in t
$CHAEBOL_t$	Chaebol dummy	1 if a firm is affiliated to a large business group in t and 0 otherwise
$DEFICIT_t$	Financing deficit in t	$DEFICIT_t = D_t + I_t + \Delta W_t - C_t$ where D_t = cash dividends in t; I_t = net investment in t; ΔW_t = change in net working capital in t; C_t = cash flows after taxes and interest (see Frank and Goyal, 2003)
DEP_t	Depreciation ratio in t	Depreciation expense in t / sales in t
$\triangle A_t$	Change in total assets in t	(Total assets in t – total assets in t-1) / total assets in t-1
$FXPROFIT_t$	FX profit-loss ratio	(FX translation & transaction profit in t – FX translation & transaction loss in t) / sales in t
$FXPROFIT\_tsl_t$	FX translation ratio	FX translation in t / sales in t
$FXPROFIT\_tsa_t$	FX transaction ratio	FX transaction in t / sales in t

$TRISK_t$	Total risk in t	ln(Standard deviation of daily stock returns in t)
$BETA_t$	Beta in t	Measured by the market model using daily stock and KOSPI returns in t
$IRISK_t$	Idiosyncratic risk in t	Standard deviation of daily abnormal returns estimated by the CAPM
$FCDEV_t$	Currency derivatives ratio	Currency derivatives in t / total assets in t
$DEVPL_t$	Derivatives profit-loss ratio	(Derivatives profit in t – Derivatives loss in t) / sales in t