

The Determinants of Foreign Currency Hedging – Evidence from Hong Kong Non-Financial Firms

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Abstract. Hong Kong is one of the largest trading economies in the world. Business opportunities attract the presence of more and more multinational companies and different currencies. Hedging currency risks has become an important and vital activity for a success business entity in Hong Kong. This paper empirically tests the determinants of foreign currency hedging for a large sample of Hong Kong non-financial firms. The findings are potentially useful for increasing firms' economic benefit and shareholders' wealth as well as improving the economic efficiency of currency hedging for companies in Hong Kong as well as in the mainland of China.

Key words: currency hedging, currency policy, financial distress, growth options, tax saving

JEL classification: F30, G32, G33

1. Introduction

Existing literature based on Western developed economies provides evidence that hedging increases expected future net cash flows, and/or reduce a firm's opportunity cost of capital, therefore hedging increases shareholders' wealth (Smith and Stulz, 1985; Graham and Smith, 1999; Bessembinder, 1991; Froot et al., 1993; Graham and Rogers, 2002). As one of the largest trading economies in Asia-Pacific region, Hong Kong (HK) exposes significant foreign currency risks. In recent years, an increasing number of public listed non-financial companies in HK conduct foreign currency hedging activities. This paper empirically analyses the determinants of foreign currency hedging for a large sample of Hong Kong non-financial firms.

Hong Kong has many its characteristics. First, it is a special administrative region of China and has its own currency. This means that it treats the mainland currency RMB as a "foreign" currency. Second, it locates more than one third headquarters of multinational companies in the region and a significant number of companies listed in the HK stock exchange are China's state-owned companies. Managers of state-owned companies are also from the mainland of China and appointed by the central government. Third, the import and export business has a dominating position in HK's economy. Major export markets include the US (17%), the EU (14%), Japan (5%) as well as the Chinese mainland (44%) in the first eight months of 2004 according to information revealed by Hong Kong Trade Development Council.

This implies that there is a large flow of foreign currencies in a daily business activity. Without any exception, firms listed in HK with international operations are subject to exchange rate risk exposure. As exchange rates fluctuate, the value of the firm's revenues or expenses also fluctuates in terms of foreign currency.

It is well understood that the value of equity shares is the present value of all expected future cash flows. The discount rate in the calculation of the present value is the firm's cost of equity capital. The uncertain outcomes of future cash flows are affected by macroeconomic factors, such as currency changes, interest rate movements, oil price changes, and the changes in the world economy and sometimes are beyond our control. However, to some extent managers can select the risks of an asset or business and use financial derivatives to offset the risks. Jorion (1990) demonstrates that the degree of foreign sales is a major determinant of exchange rate risk exposure. Géczy et al. (1997) observe that there are significant benefits of using currency derivatives for firms that have greater variation in cash flows resulted from foreign exchange rate risk.

Various hypotheses behind firms' hedging activities have been proposed in the last two decades. Among others, Mayers and Smith (1982) argue that the key effect of hedging is to decrease the external claims to the cash flow stream of firms' assets. When we recognize the government tax claim as a liability in the balance sheet, hedging makes stockholders better off since it can reduce the amount of the tax claim. Smith and Stulz (1985) and Graham and Smith (1999) indicate that firms have incentive to hedging given the progressive (convex) model in the statutory tax code and practice of tax loss carry-forwards.¹ The more convex the tax structure and hence the more volatile the firms' cash flows the greater the incentive to hedge. Dolde (1995) and Haushalter (2002) suggest that hedging can decrease the costs of financial distress and that there is a positive association between hedging and firms' debt-to-equity ratio. On the one hand, hedging may increase debt capacity and the present value of the tax shield; on the other hand, a large amount of debt increases probability of financial distress, which in turn increases the incentive for firms to hedge. Bessembinder (1991) shows that hedging can improve the quality of the investment and operating decisions. Corporate hedging increases equity holders' incentive to invest positive net present value (NPV) projects otherwise to forgo when a firm faces financial distress, and hence increases firm's value. Prior studies also link firm size to hedging activities. Nance et al. (1993), Mian (1996), Tufano (1996), Geczy et al. (1997), and Allyannis and Ofek (2000) argue that economies of scale exist in acquiring information on hedging techniques and instruments for larger firms, which have advantages in reducing transaction costs in trading financial derivatives. This implies that larger firms are more likely to hedge and smaller firms have less incentive to hedge. On the other hand, Froot et al. (1993) suggest that hedging is more likely for small firms with higher expected growth. They interpret that smaller firms are faced with greater information asymmetric, which leads to higher financing transaction costs and additional costs of external financing, so hedging may reduce these costs. Finally, Tufano (1996) shows that

managerial interests, skills and preferences may be important determinates of risk management activities.

It is interesting to examine whether or not the existing hypotheses on risk hedging apply for companies in HK and whether the fundamental determinants of hedging activities are the same as those documented in the Western developed economies. First, the HK dollar is fixed to the mainland currency RMB. Huge column sales are counted in RMB since major operations of many firms listed in HK are in the mainland of China. The pegging currency policy between the HK dollar and the RMB greatly eliminates the volatility between the two currencies and leads to the reluctance of making foreign currency hedging decisions for many firms. Indeed, Nguyen et al. (2001) observe that French firms tend to less intensively use foreign currency derivatives in post Euro period. Therefore, the currency policy of the mainland of China may play an important role for firms in HK in foreign currency hedging decision-making. Second, managers' motivation and ability are important determinants on firms' risk hedging activities. Managerial risk-aversion and managers' ability to signal have long been examined as drivers of corporate risk management (Stulz, 1984; Smith and Stulz, 1985; Demarzo and Duffie, 1995; Breeden and Viswanathan, 1996; Tufano, 1996). Grinblatt and Titman (2002) believe that the growing understanding of financial derivative contributes to managers' increasing acceptance as instruments for risk hedging. Many companies listed in the HK stock market were founded in the mainland of China. The managers appointed by the Chinese government are often short of knowledge of risk hedging. More importantly, the ownerships of companies have determined the relatively lower degree of risk aversion. Thus these managers may have less incentive to hedge firms' risks. Therefore, managers' knowledge on hedging including abilities and skills can be one of the important determinants of foreign currency hedging. Third, a functional derivative market does not exist in the mainland of China so far. A large number of companies from the mainland of China listed in the Hong Kong market have foreign operations in other countries. There is a need for them to hedge the foreign currency risk exposure. Unfortunately, up to date there are no functional futures, options and other derivative markets in the mainland of China. It is possible that the absence of futures, options and other derivative markets can affect the decision making of foreign currency risk hedging.

Our analysis shows that the currency policy is indeed the most important factor that determines foreign currency risk hedging decisions for the non-financial companies in HK. We find that a manager's incentive and knowledge on currency hedging is an important determinant of risk hedging activities. Non-existence of functional financial derivative markets has obvious disadvantage for managers from the mainland of China to access hedging instruments.

The remainder of the paper is organized as follows. Section 2 describes our research design and variable measurement. Section 3 presents the empirical results. Section 4 discusses the implications and suggestions and concludes the paper.

2. Research Design and Sample Description

This section introduces the hypotheses on foreign exchange risk hedging to be tested below and describes the sample as well as the descriptive statistics.

2.1. HYPOTHESES ON FOREIGN EXCHANGE RISK HEDGING

- (i) Tax saving hypothesis: firms with tax losses carried forward are more likely to hedge (Smith and Stulz, 1985; Graham and Smith, 1999). In order to test the tax saving hypothesis of hedging, we follow prior studies and apply a dummy variable equal to 1 if a firm has tax loss carry-forwards, otherwise 0. Information on tax loss carry-forwards is obtained from the notes to the accounts in the firms' annual reports.
- (ii) Financial distress hypothesis: hedging reduces financial distress and hedging firms borrow more (Smith and Stulz, 1985; Dolde and Haushalter, 2002). To test hypothesis of reducing financial distress by hedging activities, we use three proxies to measure the probability of financial distress. They are the gearing ratio, the long-term debt ratio, and the interest coverage ratio.² It is clear that the lower its interest cover ratio, the greater the probability of financial distress. Following prior studies, we differentiate firms involving currency only hedging and other hedging activities including interest rate risk hedging in the test.
- (iii) Investment hypothesis and size effect: whether small and/or growth firms are less likely to hedge (Bessembinder, 1991; Tufano, 1996; Geczy et al., 1997; Allyannis and Ofek, 2000). To test the hypothesis that hedging increases firms' incentive to positive NPV investment, this paper uses four proxies for growth options in the firm's investment opportunity set. These are the price-earnings ratio, the market-to-book value of equity ratio, research and development expenditure deflated by total sales and capital expenditure deflated by total sales.³ We use the natural log of total assets to measure firm size (see Judge and Clark, 2003).⁴
- (iv) In order to test hypothesis that the currency policy and other potential important determinants of hedging specific for the non-financial firms in HK, this paper employs a series of dummy variables to characterise firms listed in HK. Since profits of the sample companies are generated from either the mainland of China or outside of the mainland, a dummy variable for major foreign operation can be defined as follows. If the ratio of a company's profit made from the mainland of China to its total profits is larger than 50%, the company is classified as one whose major foreign operation is in the mainland. The corresponding dummy variable that equals to 1 if the major foreign operations of a firm in HK are taken place in the mainland of China.⁵ This facilitates us to examine the role of currency policy in the mainland on the non-financial firms hedging decision-making in HK. The relevant data is collected from the notes to the accounts disclosed in the annual reports. Since our focuses here are

companies listed in HK involving business operations with the mainland of China, we also employ a dummy variable equal to 1 if the managers of the companies are from the mainland of China. The data is obtained from biographical details of directors and management.⁶ This allows us to test whether managerial interests and skills affect hedging activities (Tufano, 1996; Grinblatt and Titman, 2002). In addition, this paper applies a dummy variable equal to 1 if the companies are originally from the mainland of China but also have foreign operations in other countries. This permits us to examine how hedging activities for those firms are affected by the absence of non-functional financial derivative markets. The relevant information is collected from the notes to the related files like segmental reporting (Secondary reporting format by geographical segment).

2.2. SAMPLE DESCRIPTION

This paper analyses the foreign currency hedging practices of HK top 500 firms ranked by market values as of year-end in 2003 accessible from Datastream. The sample contains 419 non-financial firms. The information of foreign currency hedging practices is collected from companies' annual reports of 2003 for all 419 firms by hand.

Following prior studies, a firm is said to encounter foreign currency exposure if it satisfies one of the following five criteria: (i) indicating subsidiaries in foreign countries or markets; (ii) disclosing foreign sales in notes in annual reports; (iii) reporting foreign tax; (iv) revealing the information of foreign loans; and (v) indicators of foreign currencies. There are 50 firms eliminated through this process. All 369 firms on the final list of the sample are located into two categories: (i) firms hedging foreign currency exposure; (ii) firms not hedging foreign currency exposure and firms not disclosing the information of foreign currency hedging.

In Panel A of Table I, there are 116 firms listed in HK disclosing information on foreign currency hedging. About 31 percent of firms are foreign currency hedgers in contrast with 79 percent of firms in UK that disclosed foreign currency hedging activities (Judge and Clark, 2003). 69 percent of firms either explicitly claim that they do not have foreign currency hedging activities or they fail to provide information on foreign currency hedging.

Detailing the sample of foreign currency hedgers, Panel B of Table I shows that more than 70 percent of hedging firms also hedge other exposures, such as interest rate, commodity price exposures. 61 percent hedging firms hedge both foreign currency and interest rate risks. Panel C of Table I shows that only 3 percent of foreign exchange non-hedgers are other hedgers. The description of summary statistics for the independent variables, which are used in the following univariate and multivariate tests, is presented in Table II.

Table I. Foreign exchange hedging activity disclosures by HK firms

Foreign exchange hedging activity disclosures for firms in HK		
	No. of firms	%
Panel A: Foreign exchange hedging activity		
Hedging foreign currency exposure	116	31.44
Not hedging foreign currency exposure	6	1.63
No disclosure on foreign currency hedging	247	66.94
Total	369	100
Panel B: Foreign exchange hedgers hedging other exposures		
Foreign exchange hedging only	33	28.45
Foreign exchange & interest rate hedging	53	45.69
Foreign exchange & commodity price hedging	12	10.34
Foreign exchange & interest rate & commodity price hedging	18	15.52
Total	116	100
Panel C: Foreign exchange non-hedgers hedging other exposures		
Not hedging any category of exposure	245	96.84
Interest rate hedging	6	2.37
Commodity price hedging	2	0.79
Total	253	100

3. Empirical Analysis of Foreign Currency Hedging

In this section both univariate and multivariate tests are conducted to investigate the determinants of the foreign currency hedging decisions for non-financial companies in HK.

3.1. UNIVARIATE TESTS

Differences of firms' fundamental characteristic variables between foreign currency hedgers and non-hedgers are examined using both parametric (*t*-test) and non-parametric (Wilcoxon rank sum test) tests as below.

3.1.1. Parametric Test

Common sense tells us that firms with larger foreign sales expose higher exchange rate risk and hence are more likely to hedge.⁷ Table III Panel A shows that the means of foreign sales to total sales ratios significantly differ for foreign currency hedgers and non-hedgers but the direction is opposed to what we expect. Apparently it is not a rational result. Nevertheless it is understandable that some firms do not take part in hedging activities though they have higher "foreign" sales to

Table II. Explanatory variables – summary statistics

Independent variable	N	Mean	Median	Std. Dev	Min	Max
1. Tax function convexity						
Tax loss carry-forwards dummy	369	0.217	0	0.413	0	1
2. Sources of cash flow volatility:						
Measures of Foreign Currency Exposure						
Foreign sales-to-total sales	341	0.735	0.869	0.318	0	1
Overseas tax-to-total tax	338	1.397	0.767	13.840	0	2.550
Foreign operations dummy	369	0.902	1	0.297	0	1
Major foreign operation in mainland dummy	369	0.550	1	0.498	0	1
Managers from mainland dummy	369	0.507	1	0.501	0	1
Mainland companies' foreign operation dummy	369	0.472	0	0.500	0	1
3. Expected costs of financial distress						
Gearing ratio	363	0.440	0.064	4.815	-9.939	89.336
Long term debt ratio	369	0.116	0.058	0.154	-0.019	1.279
Interest cover	347	0.588	0.008	7.553	-8.736	137.624
4. Costs of underinvestment:						
Firm growth options						
Capital expenditure-to-net sales	369	0.174	0.054	0.508	-0.011	7.444
Market-to-book ratio	369	3.652	1.328	15.548	-80.130	185.362
Price-earnings ratio	269	25.967	16.100	43.659	1.100	427.300
R&D expenditure-to-net sales	107	0.023	0.004	0.130	0.000	1.340
5. Size effect						
Market value of equity (Natural log)	369	14.298	13.938	1.302	12.847	19.966
Total assets (Natural log)	369	14.542	14.380	1.732	6.680	20.237

the mainland of China because of currency-pegging policy. Therefore higher foreign sales for firms in HK do not necessarily mean higher exchange risk exposures and have to hedge the exposures. As mentioned above, variables involved in the mainland of China are our particular interests. They include major foreign operations in the mainland of China for firms listed in HK, managers from the mainland and the mainland companies' foreign operations. Not surprisingly, there exist significant differences between foreign currency hedgers and non-hedgers for those variables. The differences for long-term debt ratios between hedging-firms and non-hedging firms are not significant. There are no significant differences for other independent variables in the catalogues of expected costs of financial distress, cost of underinvestment and tax savings between hedging-firms and

Table III. Differences between Foreign currency Hedgers and non-foreign currency hedgers

Independent variable	Non-Foreign currency hedgers			Foreign currency hedgers			Mean difference	t-stat	p-value
	N	Mean	Std. Dev.	N	Mean	Std. Dev.			
(Panel A: Two Sample T-test)									
1. Tax function convexity	253	0.225	0.419	116	0.198	0.400	0.027	0.583	0.560
Tax loss carry-forwards dummy									
2. Sources of cash flow volatility: Measures of foreign currency exposure									
Foreign sales-to-total sales	239	0.810	0.277	102	0.582	0.343	0.268	5.694	0.000
Overseas tax-to-total tax	236	1.745	16.560	102	0.590	0.339	1.155	0.704	0.482
Foreign operations dummy	253	0.913	0.282	116	0.879	0.327	0.034	1.013	0.339
Major foreign operation in mainland dummy	253	0.794	0.405	116	0.017	0.131	0.777	27.560	0.000
Managers from mainland dummy	253	0.652	0.477	116	0.190	0.394	0.463	9.780	0.000
Mainland companies' foreign operation dummy	253	0.609	0.489	116	0.172	0.379	0.436	9.331	0.000
3. Expected costs of financial distress									
Gearing ratio	248	0.560	5.813	115	0.183	0.547	0.376	0.693	0.489
Long term debt ratio	253	0.108	0.140	116	0.134	0.179	-0.026	-1.392	0.169
Interest cover	241	0.191	1.834	106	1.491	13.383	-1.300	-0.996	0.321
4. Costs of underinvestment: Firm growth options									
Capital expenditure-to-net sales	253	0.189	0.566	116	0.141	0.348	0.048	0.845	0.399
Market-to-book ratio	253	4.092	18.379	116	2.693	5.662	1.399	0.802	0.423
Price-earnings ratio	183	27.189	45.064	86	23.357	40.569	3.832	0.671	0.503
R&D expenditure-to-net sales	88	0.026	0.143	19	0.010	0.021	0.016	0.493	0.623
5. Information and transaction cost economies of scale									
Market value of equity (Natural log)	253	14.322	1.173	116	14.245	1.551	0.077	0.473	0.637
Total assets (Natural log)	253	14.553	1.676	116	14.519	1.856	0.034	0.176	0.860

(Continued on next page)

Table III. (Continued)

Independent variable	Hedgers vs non-hedgers	z-stat	P-value
(Panel B: Wilcoxon rank sum test)			
1. Tax function convexity	H < NH	-0.584	0.559
Tax loss carry forwards dummy	H < NH	-7.072	0.000
2. Sources of cash flow volatility: measures of foreign currency exposure	H < NH	-2.341	0.019
Foreign sales-to-total sales	H < NH	-1.013	0.311
Overseas tax-to-total tax	H < NH	-13.914	0.000
Foreign operations dummy	H < NH	-8.239	0.000
Major foreign operation in main land dummy	H < NH	-7.784	0.000
Managers from main land dummy	H < NH		
Main land companies' foreign operation dummy	H < NH		
3. Expected costs of financial distress			
Gearing ratio	H > NH	-0.566	0.571
Long term debt ratio	H > NH	-0.738	0.460
Interest cover	H < NH	-0.474	0.635
4. Costs of underinvestment: Firm growth options			
Capital expenditure-to-net sales	H < NH	-1.605	0.108
Market-to-book ratio	H < NH	-0.727	0.467
Price-earnings ratio	H < NH	-2.937	0.003
R&D expenditure-to-net sales	H < NH	-1.496	0.135
5. Information and transaction cost economies of scale			
Market value of equity (Natural log)	H < NH	-2.471	0.013
Total assets (Natural log)	H < NH	-0.854	0.393

Note. The second column compares the higher (lower) level of impacts of independent variables for hedgers (H) and non-hedgers (NH).

non-hedging-firms. This suggests that the significant differences between foreign currency hedgers and non-hedgers focus on sources of non-cash flow volatility in HK market.

3.1.2. *Wilcoxon Rank Sum Test*

Table III Panel B shows the results of Wilcoxon rank sum test. Consistent with the results in parametric test, we can see that foreign currency non-hedging firms have significant higher levels of ratio of foreign sale to total sales. The Wilcoxon test also shows that foreign currency non-hedging firms have significant higher levels of ratio of overseas tax to total tax. The major foreign operations for those non-hedgers are more likely in the mainland of China. Firms whose managers are from the mainland are less likely to hedge. The mean of independent variable of “mainland companies’ foreign operation” for foreign currency hedging firms is significantly lower than that of foreign currency non-hedging firms. These findings suggest that foreign currency hedging firms in HK have significantly lower exposure to foreign currency risk in the traditional sense than foreign currency non-hedging ones. It is not difficult to explain this apparently anti-intuitive evidence because of the special business relationship between HK and the mainland of China.

No evidence supports that foreign currency hedging firms in HK are more likely to have tax losses carried forward. Note that Graham and Roger (2002) argue that variable of tax loss carry-forward may not be appropriate to capture the incentive for tax saving. It may proxy for firms that have experienced financial distress in the recent past. Although foreign currency hedging firms have higher levels of gearing ratio and long term debt ratio they are not significantly different from foreign currency non-hedging firms. Therefore the results presented here do not support hypothesis on financial distress.

All independent variables used to indicate underinvestment costs of foreign currency non-hedging firms are higher than those of foreign currency hedging ones. Significant difference between the price-to-earnings ratios shows that foreign currency non-hedging firms possess higher levels of investment growth opportunities. Therefore there is no obvious evidence to support investment hypothesis either.

The tests for differences of information and transaction cost economies of scale indicate that the sizes of foreign currency hedging firms are significantly lower than those of foreign currency non-hedging firms. This indicates that small firms are more likely to hedge. While contradicting to many early studies, our results support the arguments that small firms with more potential growth options may cost more for underinvestment due to more asymmetric information and hedging may reduce costs of external financing (Froot et al., 1993). It is also consistent with argument that bankruptcy reduces a larger fraction of assets for smaller companies than for large ones (Altman, 1984). Therefore smaller firms may have a greater incentive to hedge.

3.2. MULTIVARIATE TESTS

The binary feature of the dependent variables of hedging firms and non-hedging firms makes logistic regression possible. In order to investigate the determinants of hedging activities conducted by a firm, we include the following independent variables in the logistic regression below: the tax loss carry-forwards, foreign currency exposure, the expected costs of financial distress, firm growth opportunity and the size of the firm. We define an independent variable of quality of profit as ratio of net cash flows generated from operating activities to the net income before extraordinary items and preferred dividends.⁸ Poor quality of profits may result in firms' failure to repay the loans or interests. Therefore we can use quality of profits to proxy a firm's financial distress.

Table IV shows logistic regression estimates between the likelihood that a firm hedges foreign currency exposure and proxies for incentive to hedge. The results are presented from Model 1 to Model 6. Each model presents both the estimated coefficient and elasticity of all variables respectively. According to the nature of elasticity, foreign currency exposure has the highest value and is ranked as the most important explanatory variable in each model. The tax loss carry-forwards dummy is the second most important variable. The third important variable is firm size, which is followed by the expected costs of financial distress and price-earnings ratio. Except for foreign currency exposure, both estimated coefficient and elasticity of other variables are not statistically significant. Therefore, consistent with Géczy et al. (1997) our evidence fails to support hypothesis of financial distress cost reduction. Also consistent with Graham and Rogers (2000), our evidence rejects both hypothesis of reducing costs of underinvestment and hypothesis of tax loss reduction. Our results are in sharp contrast to Judge and Clark (2003), which suggests that the UK evidence strongly supports most of the hypotheses for hedging and non-hedging firms listed in the London Stock Exchange.

Again, our empirical evidence suggests firms' foreign currency exposure factors in HK are significantly negatively related to foreign currency hedging. This finding seems to contradict to prior researches (Wysocki, 1995; Géczy et al., 1997). As explained before, the apparently contradicting evidence becomes a clear picture when we link a large proportion of "foreign" operations for firms in HK to the mainland of China and the non-floating currency policy between both sides.⁹

3.3. MODEL OF LOGISTIC REGRESSION WITH STEPWISE METHOD

To test the robustness of our results, we now use stepwise method of logistic regression to investigate the determinants of foreign currency hedging (Studenmund and Cassidy, 1987; Menard, 1995; Agresti and Finlay, 1996).

Table V shows the results of logistic regression using forward LR method. Four models are presented. Each model includes different blocks of independent variables. Since the score statistic of major foreign operation in the mainland of

Table IV. Logistic regression results of the likelihood of foreign currency hedging

Independent variables	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6		Elasticity ranking
	Coeff.	Elast.	Coeff.	Elast.	Coeff.	Elast.	Coeff.	Elast.	Coeff.	Elast.	Coeff.	Elast.	
Tax loss carry forwards dummy	0.423 (0.441)	0.205 (0.334)	-0.100 (0.795)	0.030 (0.698)	-0.188 (0.599)	0.046 (0.478)	-0.123 (0.753)	0.035 (0.234)	-0.248 (0.540)	0.072 (0.342)	-0.088 (0.822)	0.025 (0.769)	2
Major foreign operations in mainland dummy	-5.248*** (0.000)	3.941*** (0.000)											
Overseas tax-to-total tax			-0.614 (0.120)	0.243 (0.136)									
Foreign operations dummy					-0.531 (0.221)	0.230 (0.412)							
Managers from mainland dummy													
Foreign sales-to-total sales							-1.979*** (0.000)	0.619*** (0.000)	-2.391*** (0.000)	1.078*** (0.000)	-1.947*** (0.000)	0.631*** (0.000)	1
Mainland companies' foreign operations dummy													
Quality of profits	-0.047 (0.426)	0.003 (0.586)	-0.032 (0.367)	0.001 (0.423)	-0.023 (0.412)	0.001 (0.356)	-0.024 (0.419)	0.001 (0.328)	-0.040 (0.313)	0.0016 (0.265)	-0.023 (0.432)	0.000 (0.351)	4
Price-earnings ratio	-0.003 (0.386)	0.001 (0.382)	-0.001 (0.795)	0.000 (0.725)	-0.003 (0.460)	0.000 (0.485)	-0.001 (0.703)	0.000 (0.269)	-0.002 (0.680)	0.000 (0.362)	-0.001 (0.745)	0.000 (0.465)	5
Natural log of market value of equity	0.217 (0.134)	0.031 (0.376)	0.023 (0.828)	0.002 (0.686)	0.012 (0.900)	0.0012 (0.681)	-0.048 (0.651)	0.005 (0.334)	-0.005 (0.963)	0.005 (0.361)	-0.052 (0.614)	0.0053 (0.231)	3
No. of Observations	269	245	245	269	269	269	269	246	246	246	269	269	
No. of foreign currency hedgers	86	76	76	86	86	86	86	75	75	86	86	86	
No. of non-foreign currency hedgers	183	169	169	183	183	183	183	171	171	183	183	183	
-2 Log Likelihood Ratio (Chi-squared)	166.506	298.75	298.75	333.42	333.42	287.13	287.13	269.83	269.83	290.685	290.685	290.685	
Cox & Snell R Square	0.470	0.019	0.019	0.014	0.014	0.170	0.170	0.125	0.125	0.159	0.159	0.159	

Table V. Logistic regression results of the likelihood of foreign currency hedging

Independent variables	Model 1		Model 2		Model 3		Model 4	
	Coefficient	P-value	Coefficient	P-value	Coefficient	P-value	Coefficient	P-value
Major foreign operations in mainland dummy	-5.836***	0.000	-6.437***	0.000	-7.669***	0.000	-7.773***	0.000
Foreign operations dummy			2.709***	0.000	3.347***	0.000	3.421***	0.000
Overseas tax-to-total tax					2.751***	0.001	2.728***	0.001
Cash ratio							-0.127**	0.084
Model Chi-Square [df]	180.112[1]	0.000	209.591[2]	0.000	224.030[3]	0.000	228.357[4]	0.000
Block Chi-Square [df]			29.479[2]	0.000	14.393[3]	0.000	4.327[4]	0.038
% Correct predictions	85.9		90.8		90.8		91.5	
McFadden's-R ²	0.521		0.606		0.648		0.660	

Note. The model likelihood ratio(LR), or chi-square, statistic is $LR[i] = [-2 \text{ Log Likelihood (of beginning model)}] - [-2 \text{ Log Likelihood (of ending model)}]$. According to the relationship of chi-square and log likelihood, given any two values of the above equation, the unknown value is easy to get. McFadden's-R², which is also called the likelihood ratio index, is $McFadden's-R^2 = 1 - \{[-2 \text{ Log Likelihood (of ending model)}] / [-2 \text{ Log Likelihood (of beginning model)}]\}$. Therefore, McFadden's-R² can be calculated in this model.

China dummy is the highest one, it is included in Model 1. The result shows that the slope of the regression on the variable of major foreign operations in the mainland of China is -5.836 , which is significant at 1% level. According to the model Chi-square statistic, the overall model is significant at 1% level. The model predicts 85.9% of responses correctly. This confirms that firms listed in HK with major foreign operations in the mainland of China are less likely to hedge since there are “small” foreign currency risk exposures for those firms. Therefore, the currency policy is probably the most important determinant of foreign currency hedging activities for firms listed in HK.

Model 2 includes one additional theoretically important independent variable: foreign operation dummy. According to the block Chi-square statistic, this model is superior to Model 1 in terms of overall model fitting. The block Chi-square statistic is significant at 1% level. The percentage of correct predictions increases by 6% and the McFadden's R^2 value rises by 8%. The coefficients on the two variables are both statistically significant at 1% levels. It shows that firms with foreign operations are more likely to hedge than those without foreign operations.

Model 3 shows that including ratio of overseas tax to total tax variable is almost the same as Model 2 whilst the block Chi-square statistic increases by 14.393. The percentage of correct predictions remains the same.

Model 4 has four independent variables: major foreign operations in the mainland dummy, foreign operation dummy, ratio of overseas tax to total tax and cash ratio. Here we use cash ratio, defined by cash and current investments over current liabilities, to proxy the current financial distress.¹⁰ Except the cash ratio, all other variables are significant at 1% level. The model predicts 91.5% of responses correctly. The coefficient on the variable of major foreign operations in the mainland dummy is -7.773 . This suggests that firms with main foreign operations in the mainland of China are nearly 8 times less likely to hedge foreign currency exposure. In summary, the dummy variable of major foreign operations in the mainland is the most important determinant of foreign currency hedging decisions made by firms listed in HK.

4. Conclusion

In this paper, we empirically examine the determinants of foreign currency hedging activities for non-financial firms listed in Hong Kong. Unlike most previous studies based on selected samples from the US or the UK, our evidence fails to support hypotheses of tax loss reduction, financial distress cost reduction, and underinvestment cost reduction. However, our evidence does support the foreign currency exposure hypothesis. Consistent with the characteristics of HK, we believe companies' risk-hedging activities in HK are determined by some special factors. For this purpose, three additional variables are added to our empirical tests. As described in the research design, they are: currency policy (measured by major foreign operations in the mainland of China dummy); whether or not possessing up-to-date

knowledge of foreign currency hedging (measured by managers from the mainland of China dummy); and the existence of functional futures, options and other derivative markets (measured by the mainland companies' foreign operation dummy).

Our results show that the currency policy is the most important factor that determines a foreign currency hedging decision for non-financial companies in HK. Firms with major foreign operations in the mainland of China are less likely to hedge foreign currency exposure because of non-floating exchange rate between HK dollar and the mainland RMB. We find that a manager's incentive and knowledge on currency hedging is another important determinant of conducting hedging activities. Managers appointed by the central government may have less incentive to maximise shareholders' wealth and may be lack of knowledge and skills on currency hedging. Non-existence of functional financial derivative markets has obvious disadvantage for managers from the mainland of China to access hedging instruments. Different evidence between our study and prior literature shows that the determinants of conducting a hedging activity vary from market to market.

The implications to our study are clear. First, non-financial companies in HK as well as companies in the mainland of China must prepare to have a more positive attitude to currency hedge activities since China is expected to adapt a floating currency system to HK and all over the world soon or later. Second, managers from the mainland of China must realize the importance of risk hedging activities and update their knowledge on risk hedging practice. We expect a functional financial derivative market will emerge in China and hedging instruments will be available in a foreseeable future.

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Appendix

Table I presents data on the number of foreign exchange hedgers among the sample of 369 non-financial firms with foreign operations as of year-end 2003. Panel A provides data of foreign currency hedging firms. Panel B presents the number of firms whose combinations include firms hedging other exposure. Panel C presents the number of non-foreign currency hedging firms.

Table III presents the results of empirical tests of differences across a range of independent variables between currency hedgers and non-foreign currency hedgers by using two sample T-test and Wilcoxon rank sum test.

Table IV shows logit regression estimates of the relation between the likelihood of a firm hedging foreign currency exposure and proxies for incentive to hedge. Through model 1 to model 6 investigate foreign currency hedgers versus foreign currency non-hedgers including other hedgers: interest rate and/or commodity hedgers.

Table V presents logit regression using forward: LR method to investigate the relation between the likelihood of a firm hedging foreign currency exposure and proxies for incentive.

Notes

1. Progressive model in the statutory tax code results in different slopes of convexity of income tax rate. The use of historical losses to decrease a firm's taxable income for corporate tax purposes is known as tax loss carry-forwards.
2. The gearing ratio is defined as the ratio of (long-term loan (WS code #03251)+ preference shares(WS code #03451))/equity (WS code #03501) as in Datastream. The long-term debt ratio is collected by using WS code #08216, and the interest coverage ratio is defined as ratio of (EBIT (WS code #1300) + total interest charges) to total interest charges (WS code #153).
3. Book value is collected by using WS code #03501. R&D expenditure is collected by using WS code #08341. The ratio of capital expenditure to sales is collected by using WS code #08421.
4. Total asset is collected by using WS code #02999.
5. It may be more rational to classify a firm's major foreign operation in the mainland of China if the ratio of sales in the mainland to its total sales exceeds 50 percent. We use profits rather than sales since otherwise there may have a highly correlated variable "ratio of foreign sales to total sales" in our analysis. We also note that profits of firms are more commonly employed in defining firms' major operations in China (GAAP of P. R. China, (1998)).
6. Biographical details of directors and management of China mobile is available at the following wet site: <http://www.hkex.com.hk/listedco/listconews/sehk/20040331/00941/EWP107.pdf>.
7. The ratio of foreign sales to total sales is collected by using WS code #08731.
8. Quality of profits is collected by using ratio of (WS code #04860) to (WS code #01551).
9. We have also conducted logistic regression: (i) excluding other hedgers from the non-foreign currency-hedging category; (ii) foreign currency only hedgers versus non-hedgers including other exposure hedgers; and (iii) foreign currency only hedgers versus non-hedgers excluding other exposure hedgers. All test results are similar.
10. The cash ratio is collected by using ratio of WS code #02001 over WS code #03101.

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