Foreign exchange rate exposure: Evidence from Canada

Mohammad Al-Shboul [a,1], Sajid Anwar [b,c,*]

[a] Department of Accounting, Banking and Financial Sciences, College of Business Administration and Economics, Al-Hussein Bin Talal University, PO Box (20), Ma'an 71111, Jordan,
[b] School of Business, University of the Sunshine Coast, Maroochydore DC, Queensland 4558, Australia
[c] IGSB, University of South Australia, Adelaide, South Australia 5001, Australia

ARTICLE INFO

ABSTRACT

Using weekly data from 2003 to 2011, this paper examines the presence of exchange rate exposure in thirteen Canadian industry sectors. This study contributes to the literature in a number of ways: (i) it considers the presence of exposure not only in the full sample but also in the pre and post-Global Financial Crisis (GFC) periods, (ii) it considers both linear and nonlinear exposure and (iii) it makes use of the sign and size bias tests to investigate the presence of asymmetric exposure. In general, we find some evidence of linear and nonlinear exposure in the full sample as well as in the pre and post-GFC sub-samples. We also find weak evidence of an asymmetric exposure sign effect on stock returns in the full and pre-GFC sample periods. Stock returns are found to respond asymmetrically to the positive magnitude of exposure in both the-pre and post-GFC sample periods. In overall terms, the GFC appears to have weakly contributed to the overall strength of the exposure.

© 2013 Elsevier Inc. All rights reserved.

1. Introduction

Finance theory suggests that corporate foreign currency cash flows affect firm value. This effect arises from exports, imports, foreign debt, cash flows of foreign subsidiaries and foreign portfolio investments (Adler & Dumas, 1984; Jorion, 1991; Allayannis & Ofek, 2001). Furthermore, relatively more complex exposures may result from the impact of foreign exchange rate changes on prices and quantities, production costs, market shares and thus the competitive position of firms (Levi, 1994; Bartram, 2004). The empirical evidence concerning exchange rate exposure is mixed. While some studies have found strong evidence of exposure (e.g. Allayannis & Ofek, 2001; El-Masry & Abdel-Salam, 2009; El-Masry, Abdel-Salam, & Alatraby, 2007; Williamson, 2001), a large number of studies report the absence of statistically significant exposure (e.g., Al-Shboul & Alison, 2009; Atindehou & Gueyie, 2001; Bartram & Bodnar, 2012; He & Ng, 1998).

A number of explanations have been provided for this so-called exposure puzzle. It has been suggested that linear foreign exchange rate exposure can be reduced by linear hedging instruments such as forward and futures contracts (Adam, 2009; Adler & Dumas, 1984; Froot, Scharfstein, & Stein, 1993). However, due to a nonlinear relationship between corporate cash flows and exchange rates, firms may also be subject to nonlinear exposure (e.g., Giddy & Dufey, 1995). This exposure cannot be totally hedged unless nonlinear hedging instruments such as options or portfolios of options are used. A number of recent studies have considered the possibility of nonlinear exposure (e.g., Bartram, 2004; Brooks, Di Iorio, Faff, Fry, & Joymungul, 2010; Koutmos & Martin, 2003; Miller & Reuer, 1998; Williamson, 2001). Most of these studies consider firm level non-linear exposure in the US, Japan, Australia and Germany.

This paper contributes to the existing literature in a number of ways. First we consider the possibility of exposure in a number of Canadian industry sectors. Canadian industry sectors have not been subject to a broad empirical analysis, yet they offer themselves particularly well to the study of the exposure phenomenon. By making use of weekly data from 2003 to 2011, this paper considers the link between foreign exchange rate risk and stock market returns in 13 Canadian industry sectors. The sample period considered in our study includes the period of global financial crisis (GFC), which significantly affected the

---

* Corresponding author. Tel.: + 61 7 5430 1222.
E-mail addresses: m.shboul@ahu.edu.jo (M. Al-Shboul), SAnwar@usc.edu.au (S. Anwar).
[1] Tel.: +962 3 2179000x8343.

performance of financial markets. [2] We also separately consider the possibility of linear and nonlinear exposure in the pre and post 2008 GFC periods. Furthermore, this paper also investigates the *asymmetric* (sign and size) effects of exchange rate exposure on stock returns using both parametric and nonparametric tests.

The results presented in this paper suggest the presence of significant linear as well as nonlinear exposure in the full sample period of 2003–2011 as well as in the pre and post GFC sub-sample periods. Our empirical analysis also reveals relatively weak evidence of an asymmetric sign exposure effect on stock returns in the pre and also in the post GFC sample periods. In terms of the asymmetric size exposure effect, we find some evidence suggesting that negative size exposure asymmetrically affects stock returns in the full and pre GFC periods. Our empirical analysis reveals that positive size exposure strongly asymmetrically affects stock returns in the pre and post GFC periods. Finally, we find that the GFC has weakly contributed to the overall strength of the exposure.

The rest of this paper is structured as follows. Section 2 contains a brief review of the related literature on exchange rate exposure. The research methodology is described in Section 3. Section 4 contains some information on the data. The empirical analysis is presented in Section 5 and Section 6 offers some concluding remarks.

2. Review of related literature

Finance theory suggests the presence of a strong relationship between stock market returns and currency exchange rate fluctuations. However, using a linear model, early empirical studies (for example, Choi & Prasad, 1995; Jorion, 1990; Jorion, 1991) failed to find significant exchange rate exposure. A number of relatively recent studies (such as Di Iorio & Faff, 2001; Priestley & Ødegaard, 2007), utilizing different estimation techniques, have also failed to provide clear evidence of significant exchange rate exposure.[3] A number of explanations have been put forward to explain the absence of significant exchange rate exposure. Some studies have argued that the exposure may be nonlinear and hence not captured by simple linear models. The possibility of asymmetric exposure was also highlighted by subsequent studies. The aim of this section is to provide a brief review of some studies that mainly focus on testing for the presence of nonlinear exchange rate exposure. Towards the end of this section, we also provide a review of studies on Canada.

The failure of earlier studies to identify significant exchange rate exposure led to the use of nonlinear models. For example, Williamson (2001) investigated the presence of nonlinear foreign exchange rate exposure in the automotive industry of the US, Japan and Germany. While assuming that stock returns do not respond asymmetrically to currency appreciations and depreciations, Williamson introduced a quadratic foreign exchange rate variable in the classical linear model. However, this assumption is unrealistic as stock returns may differently respond to negative and positive changes in the exchange rate.[4] Bartram (2004) investigated the potential nonlinearity of exchange rate exposure by using alternative nonlinear functional forms. Based on a sample of 490 German listed corporations, Bartram suggested a convex exposure under the assumption that stock returns respond differently to negative and positive exchange rate changes. Bartram found evidence of

nonlinear exposure, especially in the case of sinus hyperbolicus and cubic functions. In summary, using nonlinear models, Bartram was able to find stronger evidence of exchange rate exposure.

In order to examine the presence of nonlinear exposure exchange rate exposure, Koutmos and Martin (2003) utilized a model where the exchange rate factor is characterized by a lognormal diffusion process, which can be decomposed into positive and negative components. Using sector-country and country-market level data from Germany, Japan, the UK and the US, they reported evidence of nonlinear exposure. In addition, they also found the exposure to be asymmetric (i.e., currency appreciation and depreciation can asymmetrically impact stock returns at the sector-country level).[5] However, at the country-market level, stronger evidence of nonlinear exposure was reported but it was not asymmetric. This mixed evidence appears to suggest the presence of time-varying exposure.

Muller and Verschoor (2006) extended the existing literature by utilizing a model that contains two exposure regimes. They argued that the shift from one regime to the other is caused by the size of exposure. By making use of data on 935 U.S. firms that were heavily involved in international trade, over the period of 1990–2001, they found evidence of nonlinear exposure. They argued that the use of a nonlinear specification increases the number of significant cases of exchange rate risk exposure. Furthermore, they found that stock returns respond asymmetrically to the magnitude of the exposure. Priestley and Ødegaard (2007) found significant nonlinear exchange rate exposure in 28 U.S. manufacturing industries. They found the exposure to be different in sign between periods of dollar appreciation and depreciation. They also found that, in general, industries that are heavily involved in international trade had a greater incidence of significant exchange rate exposure.

Doidge, Griffin, and Williamson (2006) examined the exchange rate exposure by making use of the portfolio approach. This approach involves forming portfolios of firms with high international sales (i.e., firms that are heavily involved in international trade) and portfolios of firms with no international sales. The average returns on these portfolios are compared during the periods of appreciating or depreciating currency movements. Doidge et al. found that firms with high foreign sales outperformed those with no foreign sales during periods of large positive exchange rate changes. This allowed them to conclude that exposure can economically impact firm values. Dominguez and Tesar (2006) used a sample of listed firms from eight industrialized (non-US) and emerging markets to examine the presence of exchange rate exposure. They found that the exchange rate risk exposure was larger for small firms. However, the exposure was linked to firm's foreign activity. In other words, the exposed firms adjust their financial risk management behavior differently.

Brooks et al. (2010) used a dynamic multivariate GARCH approach to test for asymmetry and time-varying risk exposures in the exchange rate and market variables. A large sample of Australian firms was tested over the period of January 2001 to December 2005. Although limited evidence of nonlinear exchange rate exposure was found, they reported a time-varying asymmetric effect primarily in the utilities sector, time-varying exposure in the materials and energy sectors and an asymmetric effect in the technology sector. Furthermore, a time-varying asymmetric exchange rate exposure was found across most size and censoring deciles. In addition, Tai (2010) investigated the presence of exposure by means of two econometric approaches: nonlinear seemingly unrelated regression and the multivariate GARCH in mean. Using industry level data from Japan, strong evidence of time-varying foreign exchange risk premium was found, which confirmed the asymmetric behavior of exposure. Using firm level data from the US over the period 1973–2007, Chung and Zhou (2012) used two-factor and multi-factor nonparametric

---

[2] Although the 2008 global financial crisis originated from risky investment in fixed-income and equity portfolios, it also significantly affected the stability of foreign currency markets. Foreign currency investors often utilize the "carry" trade profits strategy, which involves taking a long position in high interest rate currencies funded by selling or taking a short position in low interest rate currencies (Clarida, Davis, & Pedersen, 2009). The interest rate parity theory suggests that the interest differential between two currencies is offset by an appropriate movement in the relevant exchange rates. However, most carry trade investors expect that this exchange rate offset will not occur, which leads to significant gains to investors. Unwinding of the carry trade during the GFC contributed to significant volatility in foreign currency markets (Melvin & Taylor, 2009).

[3] An excellent review of the literature, especially on linear exchange rate exposure, can be found in Bartram and Bodnar (2007, Tables 1 & 2).

[4] Krishnamoorthy (2001) defended Williamson's assumption by arguing that the US industry stock returns do not respond asymmetrically to changes in the exchange rate.

[5] The issue of asymmetry has also been considered in other contexts. For example, Chong, Liu, and Shrestha (2006), Payne and Waters (2008) and De Haan and Sterken (2011) examined the issue of asymmetric changes to various types of lending/deposit rates when the central bank changes its policy rate.