

Exchange Rate Volatility and International Trade

Wong Hock Tsen*

School of Business and Economics, Universiti Malaysia Sabah, Malaysia

There is a vast amount of studies on the impact of exchange rate volatility on international trade [1-3]. The rationale of examining the impact of exchange rate volatility on international trade is that exchange rate volatility induces uncertainty into international transactions. This uncertainty decreases international trade and economic welfare [4]. Nonetheless, the impact of exchange rate volatility on international trade is theoretically and empirically ambiguous. Theoretically, exchange rate volatility can have a negative impact or a positive impact on international trade [3]. Empirically, there is no general consensus about the impact of exchange rate volatility on international trade although various measures of exchange rate volatility, different data sets either aggregated data or disaggregated data and various statistical methods such as the cointegration analysis and the panel data analysis have been tried [5,6]. The impact of exchange rate volatility on international trade can be considered as a case-by-case basis. Thus, many studies have been carried-out to examine the impact of exchange rate volatility on international trade for developing, emerging and developed countries. Nevertheless, Ćorić and Pugh [2] investigate the impact of exchange rate volatility on international trade using a meta-regression analysis on a total of 49 studies for the period from 1978 to 2002. The results demonstrate that there is an adverse impact of exchange rate volatility on international trade. Besides, the negative impact of exchange rate volatility is mostly found for study using disaggregated data. This finding is particularly significant for developing countries where forward and future and options markets are less developed compared with those in developed countries.

The standard export demand model is usually used to examine the impact of exchange rate volatility on exports whilst the standard import demand is used to examine the impact of exchange rate volatility on imports. The standard exports model is estimated as exports are a function of exchange rate, foreign income and exchange rate volatility. The standard imports model is estimated as imports are a function of exchange rate, domestic income and exchange rate volatility [7]. Alternatively, other proxy for explanatory variable is used in the standard export demand or the standard import demand model or other additional explanatory variable is included in the standard export demand or the standard import demand. For example, Hall, et al. [4] include the real export earnings of oil-exporters relative to the exports country as an additional explanatory variable in the standard export model. There are two popular measures of exchange rate volatility that are used to examine the impact of exchange rate volatility on international trade. One measure is exchange rate volatility that is expressed by the standard deviation or the moving average of standard deviation [3,4]. The other measure is exchange rate volatility that is expressed by an Autoregressive Conditional Heteroskedasticity (ARCH) type model. The most common ARCH type model used is a Generalised Autoregressive Conditional Heteroskedasticity (GARCH) model. More specifically, the GARCH (1,1) model is used [3]. Exchange rate volatility is usually generated from the real exchange rate or the real effective exchange rate [8].

The Autoregressive Distributed Lag (ARDL) cointegration approach is widely employed to examine the impact of exchange rate volatility on international trade [3,6,7,9,10]. The ARDL cointegration approach has a number of advantages for time series analysis. The approach allows for the inclusion of stationary and non-stationary variables, namely $I(0)$ and $I(1)$ variables. The approach provides a cointegration test,

short-run estimates and long-run estimates in a single estimation. Moreover, this approach is argued to be robust to small sample size [7]. The analysis of the impact of exchange rate volatility on international trade is dominated by the use of disaggregated bilateral data [3,6,7]. The use of disaggregated bilateral data in the analysis has few advantages compared to the use of aggregated data. The use of disaggregated data is free from aggregation bias because of different goods have different elasticities [6]. Furthermore, the aggregation bias problem can be happened because the impact of exchange rate volatility on some industries or commodities could be offset by insignificant impact of exchange rate volatility on other industries or commodities, which produces an insignificant impact of exchange rate volatility. Thus, the use of disaggregated data can evaluate the impact of exchange rate volatility on international trade more precisely [10].

The impact of exchange rate volatility on international trade is found to be negative particularly in the short run but the magnitude is relatively small compared with other explanatory variable such as income. Verheyen [3] examines the disaggregated Standard International Trade Code (SITC) export categories 0 to 9 of the eleven countries of the European Monetary Union (Austria, Belgium, Spain, Finland, France, Germany, Greece, Ireland, Italy, Netherlands and Portugal) to the United States (US). The data are monthly for the period from 1995:1 to 2010:8. The results show that exchange rate volatility is mostly found to have a negative impact on international trade but its effect is relatively small with the estimated long-run elasticities are mostly below unity. The long-run elasticities of the real exchange rate or the US industrial production are relatively larger. In addition, the SITC export categories 6 and 7 are mostly affected by exchange rate volatility. The study concludes that it is difficult for a country in a union currency to ignore the impact of exchange rate volatility because the impact of exchange rate volatility differs across industries and countries in one exchange rate policy. For example, exchange rate volatility does not affect Dutch exports to the US while Italian exports are depressed in many cases. Irish exports benefit from increasing in exchange rate volatility.

Baek [10] scrutinises the impact of exchange rate volatility on SITC exports and imports categories 0, 2, 3, 5, 6, 7 and 8 industry data of Korea with Japan. The data are quarterly for the period from 1991:I to 2010:IV. The results demonstrate that Korean exports and imports are relatively more responsive to the bilateral exchange rate in the short run than in the long run. Moreover, incomes in Korea and Japan are found to be significant in almost all of the industries in both the short run and long run. Korean export such as the machinery and transportation equipment (SITC 7) and mineral fuels and related materials (SITC 3)

*Corresponding author: Wong Hock Tsen, School of Business and Economics, Universiti Malaysia Sabah, Malaysia, Tel: 06-088-320000; E-mail: htwong@ums.edu.my

Received December 31, 2013; Accepted January 02, 2014; Published January 06, 2014

Citation: Tsen WH (2014) Exchange Rate Volatility and International Trade. J Stock Forex Trad 3: e126. doi:10.4172/2168-9458.1000e126

Copyright: © 2014 Tsen WH. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

are found to be very sensitive to the bilateral exchange rate. Exchange rate volatility is found to have a little role in influencing Korean trade with Japan. Bahmani-Oskooee and Harvey [9] inquest 101 US exporting industries to Malaysia and 17 US importing industries from Malaysia. The data are annually for the period from 1971 to 2006. Exchange rate volatility is found to have a negative impact on international trade mostly in the short run and not in the long run. The majority of the affected industries are found to be small industries as measured by their international trade shares. The real exchange rate itself and income are found to be important in the determination of international trade. On the other hand, Zelekha and Bar-Efrat [5] test the impact of exchange rate volatility on Israeli exports of goods to the US. The data are quarterly for the period from 1997 to 2010:I. The two-stage least squares estimator is used. Exchange rate volatility is found to have a dominant negative impact on exports in both the short run and the long run. Rahman and Serletis [11] interrogate the impact of exchange rate volatility on exports in the US using the multivariate GARCH-in-Mean vector autoregressive. The data are monthly for the period from 1973:1 to 2007:1. The variables used in the estimation are industrial production, the consumer price index, the federal funds rate, the simple-sum money supply (M2) stock, the producer price index, the trade weighted exchange index and real exports. Exchange rate volatility is the conditional standard deviation of the forecast error of the change in exchange rate. The results reveal that exchange rate volatility significantly affects exports. Accounting for volatility about exchange rate movements tends to augment the negative dynamic response of exports to a positive exchange rate shock.

The impact of exchange rate volatility on international trade is found to be predominantly positive. Bahmani-Oskooee et al. [7] inspect the impact of exchange rate volatility on bilateral aggregated export and import between the US and Brazil. The data are annually for the period from 1971 to 2010. Exchange rate volatility is the logarithm of the standard deviation of the 12 monthly real exchange rate values within that year. Of the 57 cointegrated US export industries, 20 industries are found to have a positive relationship, 9 industries are found to have a negative relationship and the rest of 28 industries are found to have an insignificant relationship. Thus, exchange rate volatility mostly does not have any significant effect on the majority of industries and the positive relationship is more than the negative relationship. The motor vehicle industry is positively affected by exchange rate volatility. Of the 57 cointegrated US imports industries, 13 industries are found to have a positive relationship and 11 industries are found to have a negative relationship and the rest of the industries are found to have an insignificant relationship. The positive relationship is more than the negative relationship. Agricultural products are mostly affected by exchange rate volatility. The study concludes that the majority of industries are not affected by exchange rate volatility in the long run, sensitivity to risk differs by industry, that is Brazilian exports of agricultural products are particularly damaged whilst the US machinery imports are not impacted and small industries are likely to be effected by exchange rate volatility. Baum and Caglayan [12] analyse the impact of exchange rate volatility on bilateral aggregated exports for 13 countries, namely the US, the United Kingdom (UK), Canada, Germany, France, Italy, Japan, Finland, Netherlands, Norway, Spain, Sweden and Switzerland using a bivariate GARCH methodology. The data are monthly for the period from 1980:I and 1998:12. Exchange rate volatility is mainly found to have a significant positive impact on international trade.

The impact of exchange rate volatility is found to be asymmetric across industries and countries. Nishimura and Hirayama [6] explore

the impact of Renminbi against Japanese Yen exchange rate volatility on international trade between Japan and China with a focus on the impact of the Renminbi reform, which is implemented on 21st July 2005. The data are daily for the period from January 2002 to December 2011. Two measures of exchange rate volatility are used, namely the Exponential Generalized ARCH (EGARCH) model (the AR(1)-EGARCH(1,1) model) and the standard deviation. The results show that Japanese exports to China are not affected by exchange rate volatility but Chinese exports to Japan are affected by exchange rate volatility. In addition, the exchange rate level is found not to have a significant impact on Japanese exports but it has a significant impact on Chinese exports. This asymmetric result may be due to differences in the depth of financial markets and in the maturity of exporters of the two countries.

Fang et al. [13] examine the asymmetric effects of exchange rate volatility on monthly bilateral exports from eight Asian countries (Japan, Korea, Malaysia, the Philippines, Singapore, Indonesia, Taiwan and Thailand) to the US using the dynamic conditional correlation bivariate GARCH(1,1)-M model. The data are monthly for the period from 1979:1 to 2003:4. For all the countries, foreign income affects exports positively and significantly with contemporaneous, one-month-lagged or two-month-lagged effects. Exchange rate depreciation exhibits the normal positive effect but proves insignificant in two countries. Exchange rate volatility produces significant effect on exports for all countries, negative or positive. Indonesia, Japan, and Taiwan respond negatively to exchange rate risk during depreciations. Korea and the Philippines respond negatively to exchange rate risk during appreciations and positively in appreciations. Malaysia exhibits a positive exchange rate risk effect during depreciations. The findings strongly support the view that exchange rate risk affects exports asymmetrically. The asymmetries response may due to factor such as the exporter asymmetric risk perception, the US dollar invoicing, original sin, fear of floating, fear of appreciation, love of depreciation and lack of foreign exchange market intervention. Thus, policy makers can consider the stability of exchange rate and its depreciation as a method of controlling export growth. Grier and Smallwood [14] investigate the impact of exchange rate volatility on international trade in 27 countries (Eight developed countries, namely Canada, Denmark, Japan, Norway, Sweden, Switzerland, the UK and the US and 19 developing countries, namely Turkey, India, Pakistan, Morocco, Nigeria, South Africa, Indonesia, Korea, Malaysia, the Philippines, Singapore, Thailand, Argentina, Brazil, Chili, Ecuador, Mexico, Peru and Venezuela). The data are monthly for the period from 1973:1 to 2007:4. The results display that real exchange rate volatility negatively affects international trade for several less developed countries and real exchange rate volatility tends to be associated with a real currency appreciation.

The panel data analysis is also employed to examine the impact of exchange rate volatility on international trade. Hall et al. [4] study the impact of exchange rate volatility on exports of emerging market economies (Argentina, Brazil, Hungary, Israel, Korea, the Philippines, Singapore, South Africa, Thailand and Turkey) and other developing countries (Bolivia, Colombia, Costa Rica, Dominican Republic, Ecuador, Guyana, Malawi, Morocco, Pakistan, Paraguay and Venezuela) using panel data analysis for the periods from 1980:I to 2006:IV and from 1980:I to 2005:IV, respectively. The generalized method of moments estimator and the time-varying-coefficient estimator are used. The generalized method of moments estimator considers the endogeneity of the explanatory variables but does not remove specification biases from the coefficients. The time-varying-coefficient estimator comprises the estimating the coefficients that are allowed to vary due and the

identifying and the removing the specification biases that affect the coefficients. Exchange rate volatility is expressed by the eight-quarter moving standard deviation of the real effective exchange rate. For other developing countries, the results expose that exchange rate volatility affects exports negatively. For emerging market economies, there is no evidence of exchange-rate volatility to have a significant negative impact on exports. The study concludes that the open capital markets of emerging market economies may have reduced the effects of exchange-rate volatility on exports compared with those in other developing countries.

Thorbecke and Kato [15] inspect the impact of exchange rate volatility on Japanese consumption exports to 17 countries using the dynamic ordinary least squares estimator and a panel data analysis for the period from 1988 to 2009. The results exhibit that a 10 percent appreciation of the yen would reduce Japanese consumption exports on average by 10 percent. A 10 percent reduction in income in the importing countries would reduce Japanese consumption exports on average by 9 or 10 percent. Depreciation among competing countries would reduce Japanese consumption exports. These results indicate that exchange rate fluctuations exert a significant impact on Japanese consumption exports. Cheung and Sengupta [8] probe the real effective exchange rate effects on the share of exports of Indian non-financial sector firms for the period from 2000 to 2010. The results reveal that indeed for the sample period a currency appreciation had a strong and significant negative impact on export shares of the firms. The real effective exchange rate volatility is also found to have a negative effect on a firm's export decision. It appears that if policy makers wish to promote exports, especially as the Indian growth rate keeps faltering in recent times, they ought to focus their efforts on stemming steady appreciation of exchange rate and reducing volatility.

The sources of exchange rate volatility can be from the monetary side and or from the real side of an economy. Exchange rate stability is pivotal for the effectiveness of monetary convergence in a common currency area. The lower exchange rate volatility leads to the greater the ability of two countries to share a common currency. Giannellis and Papadopoulos [16] examine the source of exchange rate volatility for four Central and Eastern European countries (Poland, Hungary, Czech Republic and Slovak Republic) and four European Economic and Monetary Union countries (France, Italy, Spain and Ireland). The data are monthly. For Poland and Hungary, the data are from 1991:1 to 2007:12. For Czech Republic and Slovak Republic the data are from 1993:1 to 2007:12. For France, Italy, Spain and Ireland, the data are from 1980:1 to 1998:12 and for the Euro Area, the data are from 1980:1 to 2007:12. The results display that for France and Italy during the pre-Economic and Monetary Union period, exchange rate volatility came from the monetary side and the real side of the economy. For Spain, exchange rate volatility transmission is from the interest rate differential to exchange rate and from exchange rate to the stock market. Also, there is evidence of reciprocal volatility spill over effects between exchange rate and the interest rate differential. These results support that the foreign exchange market development in Spain had been influenced by the monetary and real factors. For Ireland, exchange rate volatility is driven only by the real side of the economy. The study implies that monetary instability boots exchange rate volatility. Thus, exchange rate volatility can be reduced by stabilising the monetary side of an economy.

In a summary, the analysis of the impact of exchange rate volatility on international trade is dominated by using disaggregated data, namely bilateral international trade at the industry level. The impact of exchange rate volatility is found to be negative but the magnitude is relatively small compared with the magnitude of other explanatory variable. The impact of exchange rate volatility can be asymmetric across industries and countries. The panel data analysis is also employed to examine the impact of exchange rate volatility on international trade. The sources of exchange rate volatility can be from the monetary side and or from the real side of an economy. There is still a vast room for further research on this topic.

References

1. Bahmani-Oskooee M, Hegerty SW (2007) Exchange rate volatility and trade flows: A review article. *Journal of Economic Studies* 34: 211-255.
2. Ćorić B, Pugh G (2010) The effects of exchange rate variability on international trade: A meta-regression analysis. *Applied Economics* 42: 2631-2644.
3. Verheyen F (2012) Bilateral exports from euro zone countries to the US - Does exchange rate variability play a role? *International Review of Economics & Finance* 24: 97-108.
4. Hall S, Hondroyannis G, Swamy PAVB, Tavlakos G, Ulan M (2010) Exchange-rate volatility and export performance: Do emerging market economies resemble industrial countries or other developing countries? *Economic Modelling* 27: 1514-1521.
5. Zelekha Y, Bar-Efrat O (2011) The link between exchange rate uncertainty and Israeli exports to the US: 2SLS and cointegration approaches. *Research in Economics* 65: 100-109.
6. Nishimura Y, Hirayama K (2013) Does exchange rate volatility deter Japan-China trade? Evidence from pre- and post-exchange rate reform in China. *Japan and the World Economy* 25-26: 90-101.
7. Bahmani-Oskooee M, Harvey H, Hegerty SW (2013) The effects of exchange-rate volatility on commodity trade between the U.S. and Brazil. *The North American Journal of Economics and Finance* 25: 70-93.
8. Cheung YW, Sengupta R (2013) Impact of exchange rate movements on exports: An analysis of Indian non-financial sector firms. *Journal of International Money and Finance* 39: 231-245.
9. Bahmani-Oskooee M, Harvey H (2011) Exchange-rate volatility and industry trade between the U.S. and Malaysia. *Research in International Business and Finance* 25: 127-155.
10. Baek J (2013) Does the exchange rate matter to bilateral trade between Korea and Japan? Evidence from commodity trade data. *Economic Modelling* 30: 856-862.
11. Rahman, S, Serletis A (2009) The effects of exchange rate uncertainty on exports. *Journal of Macroeconomics* 31: 500-507.
12. Baum CF, Caglayan M (2010) On the sensitivity of the volume and volatility of bilateral trade flows to exchange rate uncertainty. *Journal of International Money and Finance* 29: 79-93.
13. Fang WS, Lai Y, Miller SM (2009) Does exchange rate risk affect exports asymmetrically? Asian evidence. *Journal of International Money and Finance* 28: 215-239.
14. Grier KB, Smallwood AD (2013) Exchange rate shocks and trade: A multivariate GARCH-M approach. *Journal of International Money and Finance* 37: 282-305.
15. Thorbecke W, Kato A (2013) The effect of exchange rate changes on Japanese consumption exports. *Japan and the World Economy* 24: 64-71.
16. Giannellis N, Papadopoulos AP (2011) What causes exchange rate volatility? Evidence from selected EMU members and candidates for EMU membership countries. *Journal of International Money and Finance* 30: 39-61.