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THE IMPACT OF EXCHANGE RATE VOLATILITY ON EXPORTS: ADDITIONAL EVIDENCE FOR FOUR EUROPEAN COUNTRIES

Abstract

This paper examines the effect of exchange rate volatility for a set of four European countries (Norway, Poland, Hungary and Switzerland) to aggregate exports during the period of 1973 q1 – 2004 q4. After critically reviewing the empirical literature we are able to conclude that empirical researchers often examine the hypothesis that exchange rate volatility is a major source of risk. As a result it is often claimed by some researchers that exchange rate volatility causes individual producers to switch their production form foreign to domestic markets where there is less risk. This switch will therefore cause a reduction in the overall level of trade. The review of the literature has identified mixed results with regard to the effects of exchange rate volatility and its potential effects on the level of trade. Therefore the ranges of expected relationships are: a negative relationship, a positive relationship, an indeterminate or no relationship between exchange rate volatility and the level of exports. We therefore examine the effects of exchange rate volatility by utilizing a measure of the standard deviation of the moving average of the logarithm of real exchange rate as a measure of exchange rate volatility and by adopting a conceptual framework of the imperfect substitution reduced form export quantity model similar to that of Arize. Overall

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our results have proved to be consistent with our past examinations which for the main part did not estimate any overall significant aggregate effects from volatility to exports. Out of the four sample countries examined in this study for only one the exchange rate volatility coefficient proved to be significant leaving the remaining countries with an insignificant relationship.

Key words:

Exports, E. U., Exchange Rate Volatility.

JEL: F10, E00.

1. Introduction

This paper looks at the impact of exchange rate volatility on real aggregate exports for the countries: Norway, Poland, Hungary and Switzerland for 1973:q1–2006:q4. We use the standard deviation of the moving average of the logarithm of real exchange rate as a measure of exchange rate volatility. Overall our results suggest that exchange rate volatility has no major effects on aggregate exports for these European countries.

With the move from fixed to flexible exchange rates in Europe in 1973, there was an increasing concern about effects of exchange rate variability on trade. Economic theory (Clark P., 1973, p. 302–313) suggests that exchange rate variability creates uncertainty with regard to the prices exporters would have to pay and receive in the future. More specifically, since most trade contracts incorporate payment lags to allow time for delivery or to provide trade credit they produce uncertainty over the future price of foreign currency and the importers' own profits. As a result, producers may prefer the possibility of more certain profits to the possibility of uncertain ones. Therefore, uncertain revenue will encourage producers to switch away from foreign markets to domestic ones, which in turn will cause a reduction in the level of exports. This is an argument for negative effects although it is possible, in certain theoretical models to have positive effects. Early empirical work seemed to favor negative effects although there were many findings of an insignificant relationship between export quantity and exports (Hooper P. and Kohlagen S., 1978, p. 483–511).

In the 1980's (1980–1989) some positive and negative statistically significant relationships were found (Thursby J. and Thursby M, 1987, p. 488–495) along with null results (Bailey M., Tavlas G. and Ulan M., 1986, p. 465–477). Cushman published a series of studies (Cushman D., 1983, p. 45–63, 1986, p. 361–379, 1988, p. 317–330), using more advanced time-series methods than earlier studies finding mixed results. Later researchers have identified a positive relationship (Asseery A. and Peel D., 1991, p. 173–177) while others identify negative (Arize A., 1995, p. 37–51, 1996, p. 187–205, 2000, 345–369) or in some cases no relationship at all (Arize A., 1999, p. 345–369). In the last period starting from 2000 and onwards there is some variation in the empirical research (Abbott A., Darnell A. and Evans, 2001, p. 47–49; Doganlar M., 2002, p. 859–863; Du H. and Zhu Z., 2001, p. 106–121; Bredin, Fountas and Murphy, 2003, p. 193–208). This variation is with regard to the different sample countries, time periods as well as different volatility measures and different types of exchange rates used. With regard to the empirical estimation of the equations the bulk of the research utilizes mainly either ECM or ARCH-GARCH estimation techniques. The variation with regard to the sample countries consists of four categories. These countries are: developed countries, developing countries, a mixed sample, containing European as well as other countries and finally a sample containing only European countries. For the most part the literature seems to examine developing countries although there is some empirical work containing a mixture of various countries of the world. Finally the smallest part of the literature examines only European countries. The range of the estimated relationships between exports and exchange rate volatility remains the same as in the previous periods.

2. The countries and data

Having examined the effects of exchange rate volatility on aggregate exports in our past empirical work (Serenis D., 2006, p. 117–167; Serenis D., Cameron S. and Serenis P., 2008, p. 375–376; Serenis D. 2009) we would like to provide some additional empirical examination by extending our investigation to include an additional set of four European countries. The reason for the selection of these sample countries is on the basis that empirical literature has provided limited examination on the effects of exchange rate volatility to exports. We therefore examine the effects of exchange rate volatility for: Norway, Poland, Hungary and Switzerland and for the time period of 1973:q1–2004:q4. All data are from the IFS (International Financial Statistics) with the exception of GDP figures which will be derived form Eurostat.

3. Methodology and results

Our research will utilize a reduced form equation similar to that of Arize. More specifically:

$$log(X) = \lambda 0 + \lambda 1 * log(PX/Pw) + \lambda 2 * log(GDP) + \lambda 3 * log(T) + \lambda 4 * (V) + \lambda 5 * (D2) + \lambda 6 * (D3) + \lambda 7 * (D4) + \omega,$$

Where:

X is real exports (volume of exports deflated by unit value of exports),

PX/Pw the relative prices,

GDP real domestic GDP,

T a time trend,

V volatility (defined as the standard deviation of the moving average of the logarithm of real exchange rate and D2, D3, D4 a set of seasonal dummies).

ω an error term

Furthermore we will estimate potential effects of volatility to the level of exports through the utilization of the error correction methodology. If the index of domestic capacity raises the country's capacity to produce increases and so will exports. We would therefore, expect λ2 to be positive, on the other hand if the relative prices rise the demand for exports will fall so we would expect λ1 to be negative (Goldstein and Khan, 1976). With regard to the effects of exchange rate volatility the expected result could be either positive, negative, or will have no effect.

4. Unit root and co-integration

Consistent with the error correction methodology we continue by presenting the results of the augmented Dickey Fuller unit root test as well as the Engle Granger co-integration test results.

As we can see the results of the unit root tests indicate that most of the countries in our sample contain at least one unit root of order no higher than 2.

With regard to the co-integration test all of the countries of our sample with the exception of Poland, have no co-integrating relationship.

Table 1

Augmented Dickey Fuller unit root test

Country	Variables and relationship			
	Vex	*GDP*	*V*2	*P*
Norway	*I* (1)	*I* (1)	*I* (0)	*I* (1)
Poland	*I* (1)	*I* (2)	*I* (0)	*I* (1)
Switzerland	*I* (2)	*I* (0)	*I* (0)	*I* (1)
Hungary	*I* (1)	*I* (2)	*I* (0)	*I* (1)

All tests are performed using the 5 % level of significance *Vex* represents the export quantity, *GDP* represents the real gross domestic product, *V*2 volatility and *P* is the relative prices of the each country to the world price*For: Poland and Hungary industrial production has been used as a proxy for gross domestic product*All tests are performed to a maximum of three lags

Table 2

Engle Granger Co-integration test

Country	Variables and relationship
Norway	No co-integration
Poland	Co-integration
Switzerland	No co-integration
Hungary	No co-integration

All tests are performed using the 5 % level of significance For: Poland and Hungary industrial production has been used as a proxy for gross domestic product

5. Results

Given the absence of co-integration for Norway, Hungary and Switzerland we use a model in first difference. The results are presented in Table (3).

For the most part all the control variables contain the expected signs (*GDP, P*). With regard to the remaining variables, one out of the three countries with no co-integration had a negative coefficient for volatility leaving the remaining ones with a positive one. However, the volatility coefficients did not turn out to be significant at the standard 5 % level of significance for all the countries in our sample. Due to the presence of co-integration for the remaining country of our sample (Poland) an error correction model will be estimated. The results of this estimation are presented in table (4).

Table 3

Estimated First difference regressions

Countries	Variables				
	Constant	*P*	*GDP*	*V*2	Statistics
Norway	0.093064 (1.597286)	-0.214587 (-1.61602)	0.452144 (2.216328)	0.084920 (0.054851)	*D.W* = 2.66218 *S.E* = 0.061996 *R*2 = 0.528307
Switzer-land	0.008628 (0.086511	-1.407490 (-9.997947)	0.467872 (2.115661)	-1.766870 (-1.489028)	*D.W* = 2.61349 *S.E* = 0.032552 *R*2 = 0.848753
Hungary	0.014267 (0.094867)	-1.177576 (-2.24704)	1.395295 (3.907811)	2.601718 (0.822489)	*D.W* = 3.13627 *S.E* = 0.13747 *R*2 = 0.703693

All tests are performed using the 5 % level of significance *GDP* represents the real gross domestic product, *V*2 volatility and *P* is the relative prices of the each country to the world price*For: Poland and Hungary industrial production has been used as a proxy for gross domestic product *All variables are in a linear form

Table 4

Estimated error correction model regressions

Countries	Variables					
	Constant	*P*	*GDP*	*V*2	*ECM*	Statistics
Poland	-0.076039 (-0.35497)	-0.930457 (-6.70452)	-0.107356 (-0.369550)	0.482297 (2.503543)	-0.350610 (-3.955435)	*D.W* = 2.75751 *S.E* = 0.116954 *R*2 = 0.760156

All tests are performed using the 5 % level of significance *GDP* represents the real gross domestic product, *V*2 volatility and *P* is the relative prices of the each country to the world price*For: Poland and Hungary industrial production has been used as a proxy for gross domestic product*All variables are in a linear form

As in the previously presented countries so as for Poland the control variables present the expected signs. Volatility however, presents a positive relationship which proved to be significant at the standard 5 % level of significance.

6. Conclusion

It has been argued by some empirical researchers that exchange rate volatility has a negative effect on the level of exports. Having examined a set of E.U. countries in our past empirical work, in this study we have extended our investigation with the inclusion of a set of four additional European countries. The results of our study have proved to be consistent with our past examinations which for the main part did not estimate any overall significant aggregate effects from volatility to exports. In this study our examination has been able to estimate a negative as well as a positive relationship with regard to the effects of volatility on aggregate exports. However, with the exception of one country (Poland) all of the estimated coefficients proved to be insignificant at the standard 5 % level of significance. We therefore conclude that over all exchange rate volatility has not been able to produce any significant overall effects to real aggregate exports in Europe.

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