African Development Review, Vol. 21, No. 3, 2009, 499–513

Exchange Rate Volatility and Trade: An Empirical Investigation from Cross-country Comparison

Ilhan Ozturk* and Huseyin Kalyoncu**

***Abstract*:** This paper investigates empirically the impact of exchange rate volatility on the trade flows of six countries over the quarterly period of 1980–2005. The impact of a volatility term on trade is examined by using an Engle-Granger residual-based cointegrating technique. The major results show that increases in the volatility of the real exchange rate, approximating exchange-rate uncertainty, exert a significant negative effect on trade for South Korea, Pakistan, Poland and South Africa and a positive effect for Turkey and Hungary in the long run.

1. Introduction

Since the adoption of a floating exchange-rate regime in 1973, due to the breakdown of Bretton-Woods, the effects of exchange-rate volatility on the volume of international trade have been the subjects of both theoretical and empirical investigations. The traditional argument views the unexpected exchange rate fluctuations as a potential source of risk. Therefore, risk-averse agents, generally, reduce their export-import activity and reallocate production to domestic markets. Economic fundamentals such as the inflation rate, interest rate and the balance of payments, which have become more volatile in the 1980s and early 1990s, by themselves, are sources of exchange rate volatility. As also mentioned by Hook and Boon (2000), increase in cross-border flows that have been facilitated by the trend towards liberalization of the capital account, the advancement in technology, and currency speculation have also recently caused the exchange rate to fluctuate.

*Faculty of Economics and Administrative Sciences, Cag University, 33800, Yenice, Mersin, Turkey; tel: +90 324 6514828, fax: +90 324 6514811, e-mail: ilhanozturk@cag.edu.tr
**Faculty of Economics and Administrative Sciences, Meliksah University, Kayseri, Turkey; e-mail: hkalyoncu@meliksah.edu.tr

The volatility of exchange rates is the source of exchange rates risk and has certain implications on the volume of international trade, consequently on the balance of payments. Hooper and Kohlhagen (1978) argue that higher exchange rate volatility leads to higher cost for risk-averse traders and to less foreign trade. This is because the exchange rate is agreed on at the time of the trade contract, but payment is not made until the future delivery actually takes place. If the exchange rate becomes more volatile, this creates uncertainty about the profits to be made, and hence reduces the benefits of international trade. Therefore, it is widely believed that increases in exchange rate volatility will depress the volume of trade. It is also claimed that the degree of risk aversion is important in order to determine the effect of exchange rate uncertainty on exports. For example, an exporter who shows a low degree of risk aversion will prefer to export less since higher exchange rate volatility reduces the expected marginal utility of export revenue. Therefore, the exchange rate volatility may have negative or positive effects on exports and the theory cannot determine the relation between foreign trade and the volatility of exchange rates (De Grauwe, 1988; Arize, 1997; McKenzie, 1999).

The purpose of this paper is to contribute to the empirical discussion on the impacts of exchange rate volatility on the trade of six countries; namely South Korea, Pakistan, Poland, South Africa, Turkey and Hungary, over the quarterly period of 1980:1–2005:4. The effects of exchange rate volatility on trade are examined by using an Engle-Granger residual-based cointegrating technique.

The rest of the paper is organized as follows: Section 2 presents the literature survey on exchange rate volatility and trade. Section 3 describes the methodology employed and the sources of data collected. Section 4 reports the estimated results, and the last section is the conclusion.

2. Literature Survey

This section presents a literature survey on the effects of exchange rate volatility on trade (see Table 1 for some selected studies on exchange rate volatility-trade nexus). Numerous studies have been conducted to investigate whether trade is influenced by exchange rate volatility.[1] Most of these works confirmed that the rise in exchange rate volatility in general has some consequences on trade flows. Nevertheless, no real consensus about the effects of exchange rate volatility on trade has emerged. The findings, however, depend on many factors such as the sample periods, methodology, estimation techniques, measures of volatility and countries considered (developed versus developing). But, it is widely believed that increased exchange rate volatility inhibits the growth of foreign trade.

Table 1: Exchange rate volatility and trade: literature survey

Study	Sample period	Estimation technique used	Main results
Akhtar and Hilton (1984)	1974–1981Q	OLS	Negative effect
Gotur (1985)	1974–1982Q	OLS	Little to no effect
Bailey *et al.* (1986)	1973–1984Q	OLS	Not significant, mixed effects
Bailey *et al.* (1987)	1962–1985Q	OLS	Little to no effect
Brada and Mendez (1988)	1973–1977A	Cross section	Positive effect
Pere and Steinherr (1989)	1960–1985A	OLS	Negative effect
Savvides (1992)	1973–1986A	Cross section	Negative effect
Chowdhury (1993)	1973–1990Q	VAR	Significant negative effect
McKenzie and Brooks (1997)	1973–1992M	OLS	Positive effect
McKenzie (1998)	1969–1995Q	ARCH	Generally positive effect
Aristotelous (2001)	1989–1999A	Gravity model	No effect on export
Vergil (2002)	1990–2000Q	Standard deviation	Negative effect on export
Das (2003)	1980–2001Q	ADF, ECM, Cointegration	Significant negative effect on export
Baak (2004)	1980–2002A	OLS	Significant negative effect on export
Kasman and Kasman (2005)	1982–2001Q	Cointegration, ECM	Significant positive effect on export
Arize *et al.* (2005)	1973–2004Q	Cointegration, ECM	Significant negative effect on export
Chit (2008)	1982–2005Q	Panel cointegration	Significant negative effect on export
Hondroyiannis *et al*. (2008)	1977–2003Q	Panel-data estimation techniques	Significant negative effect on trade

Note: A = annual, Q = quarterly and M = monthly.
Source: Ozturk (2006, pp. 88–92).

In several empirical studies[2] conducted on the effects of exchange rate volatility on trade it was found that exchange rate risk depresses trade flows. In addition, several theoretical studies, such as Ethier (1973), Clark (1973), Cushman (1986) and Pere and Steinherr (1989), have shown that an increase in exchange rate volatility will have adverse effects on the volume of international trade.

However, studies by Hooper and Kohlhagen (1978), Gotur (1985), Bailey *et al*. (1986, 1987), Bailey and Tavlas (1988), Gagnon (1993), McKenzie (1998, 1999), and Aristotelous, (2001), among others, do not find any significant relationship between exchange-rate volatility on trade. On the other hand, Brada and Mendez (1988), Klein (1990), Franke (1991), Sercu and Vanhulle (1992), McKenzie and Brooks (1997), Doyle (2001), Bredin *et al*. (2003), Kasman and Kasman (2005), have found positive effects of exchange rate volatility on trade. In conclusion, no real consensus about the effects of exchange rate volatility on trade has emerged in the literature.

3. Model Specification and Data

In the field of International Economy, many researchers, for example Gotur (1985) and Chowdhury (1993), used the model for empirical study that provides a standard long-run relationship among real exports, the level of real activity, competitiveness and exchange rate volatility to examine the volatility-trade relationsip. The econometric model used in this study has been used by Arize (1996) and Asafu-Adjeye (1999). This model differs from other models in terms of using real exchange rate as an explanatory variable to examine the volatility-trade relationship. The model is as follows:

$$\ln X_t = \beta_0 + \beta_1 \ln Y_t + \beta_2 \ln P_t + \beta_3 \ln RER_t + \beta_4 \ln V + u_t \qquad (1)$$

where X is real export (nominal export / export price index); Y is a measure of real foreign activity (industrial production in industrialized countries) used as a proxy for the trend of GDP[3]; P is relative prices (home export price index / industrial countries export price index); RER is the real exchange rate; and V is a measure of exchange rate volatility.

The theoretical expected signs of the coefficients are:

$B_1 > 0$ it is expected that increases in real economic activity of foreign activity result in a greater volume of exports to those countries.

$B_2 < 0$ decrease in the export prices of a country should increase the quantity of exports demanded.

$B_3 > 0$ appreciation of the real exchange rate shows the depreciation of the country's money against foreign currencies. The depreciation of the country's money will induce cheaper export products which will increase demand. Therefore, the sign of this coefficient is expected to be positive.

$B_4 >< 0$ unknown. It depends on the degree of risk aversion. If producers are sufficiently risk averse, an increase in the exchange rate risk raises the expected marginal utility of export revenue and therefore induces them to increase their export activity. If, however, producers are not very risk averse, a higher exchange rate risk reduces the expected marginal utility of export revenues and therefore leads them to produce less for export (De Grauwe, 1988, p. 66).

Moving sample standard deviation of the growth rate of the real exchange rate, as defined by Equation 2, is used in this section to measure the volatility of the exchange rate.[4]

$$V_t = \left[\frac{1}{m} \sum_{i=1}^{m} (\ln R_{t+i-1} - \ln R_{t+i-2})^2 \right]^{\frac{1}{2}} \quad (2)$$

where m is the order of moving average and R is the real exchange rate. The order of moving average, $m = 4$, is used throughout the measures of volatility. By using different values of m estimation has also been performed. The robustness of the results is independent of the value of m. The real exchange rate (RER) is defined in terms of US consumer prices.

All quarterly data has been taken from the International Financial Statistics (IFS) and the Central Bank of the Republic of Turkey (CBRT) electronic data delivery system. Due to unavailability of data, sample sizes differ for countries. For Hungary and South Korea data from 1980q1–2005q4 is used. For Pakistan and South Africa 1980q1–2005q2 is used. For Poland 1985q1–2005q3 and Turkey 1982q1–2005q4 are used. All series are expressed in logarithms. These countries are selected from emerging economies.

4. Empirical Results

We first perform unit root tests in levels and first differences in order to determine univariate properties of the series used in this study. We, therefore, use the classical unit root tests, namely, the Augmented Dickey–Fuller (ADF) test. The ADF test is based on the null hypothesis that a unit root exists in the time series. The results of the ADF unit root tests in Table 2 show that all variables are non-stationary in their levels. However, they are stationary in their first differences. The values in brackets indicate the lag structure in ADF. The lag structure is determined by using the minimum value of Schwarz's Information Criterion (SIC). These results indicate that the cointegrating technique has to be applied in order to analyze the long-run relationship between these variables. An Engle–Granger (1987) residual-based cointegrating method is utilized for this purpose.

The implementation of the Engle–Granger procedure (Table 3) indicates that there is a long-run equilibrium relationship among real export, relative prices, real foreign demand, real exchange rate and exchange rate volatility since test statistics are above the 5 percent critical value except for Poland. The cointegrating relationship is valid for Poland at the 10 percent critical level. These results claim that any deviation from this relationship is temporary and a long-run equilibrium relationship among these variables exists.

As can be seen in Table 3, the signs of the terms are as expected for Pakistan and South Korea but are not as expected for Hungary, Poland, South Africa and Turkey. The foreign activity term is positively related to the real exports and this term has a large effect on the exports of these countries. The

Table 2: Unit root test results

	Test statistics			
	Level		First difference	
Country and series	τ_τ	τ_μ	τ_τ	τ_μ
Hungary				
INX	−0.886 (4)	1.057 (4)	−4.535 (3)*	−4.141 (3)*
INY	−2.467 (9)	−1.168 (9)	−3.653 (8)**	−3.591 (8)*
INP	−2.054 (0)	−2.518 (0)	−10.720 (0)*	−10.54 (0)*
INRER	−2.581 (1)	−0.002 (0)	−7.920 (0)*	−7.766 (0)*
INV	−1.614 (4)	−1.627 (4)	−7.685 (3)*	−7.726 (3)*
Poland				
INX	−1.455 (8)	1.493 (8)	−3.481 (7)**	−2.809 (7)***
INY	−2.360 (5)	−1.519 (5)	−4.740 (4)*	−4.627 (4)*
INP	−2.889 (7)	−3.275 (4)	−6.720 (6)*	−5.235 (6)*
INRER	−2.430 (0)	−0.906 (0)	−8.617 (0)*	−8.619 (0)*
INV	−3.020 (5)	−2.523 (5)	−5.333 (3)*	−5.380 (3)*
Pakistan				
INX	−2.413 (4)	−0.131 (4)	−5.747 (3)*	−5.654 (4)*
INY	−2.426 (9)	−1.149 (9)	−3.656 (8)**	−3.590 (8)*
INP	−2.089 (0)	−1.713 (0)	−11.100 (0)*	−11.150 (0)*
INRER	−2.332 (1)	−1.831 (1)	−6.769 (0)*	−6.651 (0)*
INV	−3.418 (0)	−3.382 (0)	−8.135 (0)*	−8.175 (0)*
South Korea				
INX	−2.229 (4)	0.348 (4)	−4.857 (3)*	−4.839 (3)*
INY	−4.647 (1)	−4.484 (1)	−7.022 (3)*	−7.082 (3)*
INP	−2.440 (1)	0.006 (1)	−7.776 (0)*	−7.664 (0)*
INRER	−2.383 (1)	−2.373 (1)	−7.301 (0)*	−7.321 (0)*
INV	−2.631 (0)	−2.497 (0)	−7.022 (3)*	−7.082 (3)*
South Africa				
INX	−3.905 (2)	−0.012 (2)	−10.670 (1)*	−10.630 (1)*
INY	−2.426 (9)	−1.149 (9)	−3.656 (8)**	−3.590 (8)*
INP	−2.066 (0)	−2.479 (0)	−11.070 (0)*	−10.910 (0)*
INRER	−3.078 (3)	−2.790 (3)	−4.248 (2)*	−4.191 (2)*
INV	−2.888 (0)	−2.886 (0)	−7.091 (3)*	−7.109 (3)*
Turkey				
INX	−2.427 (4)	−0.056 (4)	−4.949 (3)*	−4.970 (3)*
INY	−2.666 (5)	−1.776 (5)	−5.340 (4)*	−5.172 (4)*
INP	−2.282 (0)	−2.473 (0)	−7.696 (1)*	−9.748 (0)*
INRER	−2.144 (2)	−1.382 (2)	−8.316 (1)*	−8.250 (1)*
INV	−3.078 (4)	−2.873 (4)	−6.613 (3)*	−6.652 (3)*

Note: The subscripts μ and τ indicate the models that allow for a drift term and both a drift and a deterministic trend, respectively. Asterisks (*), (**) and (***) show significance at 1%, 5% and 10% levels, respectively. Figures in parentheses indicate the lag length. The critical values are obtained from MacKinnon (1991) for the ADF test. ADF test examines the null hypothesis of a unit root against the stationary alternative.

long-run income elasticity is greater than unity and ranges from (1.33) to (5.08). As a result of a cointegration model, the real foreign income has the greatest impact on exports. Since coefficients are high, the results are consistent with the results of previous studies (Arize *et al*., 2000, 2003).

Table 3: Engle–Granger cointegration test results

Country	Cointegrating vector	ADF
Hungary	INX = −9.776 + 4.987*INY + 2.951*INP + 0.623*INRER + 9.252*INV	−2.702 (4)*
Poland	INX = −6.842 + 4.462*INY + 0.667*INP − 0.182*INRER − 0.471*INV	−1.829 (8)**
Pakistan	INX = −3.652 + 2.365*INY − 1.111*INP + 0.188*INRER − 0.922*INV	−2.568 (4)*
South Korea	INX = −5.515 + 3.904*INY − 1.372*INP + 0.122*INRER − 1.383*INV	−3.856 (9)*
South Africa	INX = −1.024 + 1.331*INY + 0.214*INP + 0.304*INRER − 0.691*INV	−6.328 (0)*
Turkey	INX = −8.274 + 5.088*INY + 0.828*INP − 0.073*INRER + 1.795*INV	−2.176 (4)*

Note: Asterisks (*) and (**) show significance at 5% and 10% levels, respectively.

Export income elasticity is less than 2 in developed countries, whereas it is above 2 for the developing countries.

The relative price term, in other words price elasticity term, has a negative sign for Pakistan and South Korea as expected but has a positive sign for Hungary, Poland, South Africa and Turkey. The relative price term ranges from (−1.37) to (2.95). Although it is interesting that export price coefficients are positive, they are again consistent with some previous studies (Arize *et al*., 2000; Chowdhury, 1993). The sign of the real exchange rate term is positive except for Poland and Turkey. The coefficient of real exchange rate term ranges from (−0.18) to (0.62).

The sign of the exchange rate volatility term is negative except Hungary and Turkey and ranges from (−1.383) to (9.25). The negative sign for the volatility term indicates that if volatility (uncertainty) in exchange rate increases, risk-averse producers will favor domestic trade to international trade.

An interesting result is that the long-term coefficients of the exchange rate volatility term for Hungary, South Korea, South Africa and Turkey are higher than the coefficient of the relative price term, which means that exchange rate volatility is more effective on the exports than the relative price term. The results also indicate that Hungary exporters are the most sensitive to volatility in the exchange rates.

The final stage in this work is the construction of the error correction model (ECM). The model structures are determined using Hendry's general-to-specific model selection strategy. This procedure requires elimination of insignificant lags from the estimation. Diagnostic tests were also applied in order to obtain proper specifications of the estimated equations. The results are shown in Table 4.

The error correction term's coefficient is found negative in each of the six cases. The coefficients of the error correction term indicate that the speed of adjustment for Hungary, Poland, South Korea and Turkey is very low. These results indicate that the adjustment of real exports to any change in the regressors may take a long time to return to the equilibrium. In other words, market forces in the export market restore equilibrium slowly. However, the speed of adjustment in Pakistan and South Africa is higher than in the other countries.

The coefficients on the foreign income, relative price and reel exchange rate variables in the ECMs show how the average speed to export adjustment is in response to these variables.

It can be seen that the export is mostly affected by real foreign income in the short run as in the long run. The coefficient value of the real foreign income is greater than other explanatory coefficient values. The effect of the foreign demand term is larger than the relative price term for all countries except Hungary.

A significant coefficient has not been found for the real exchange rate term for Hungary, Poland, Pakistan, South Korea and Turkey. However,

Table 4: Regression results for error correction models

Country variables	Hungary	Poland	Pakistan	South Korea	South Africa	Turkey
EC_{t-1}	−0.087(−2.14)*	−0.023(−0.40)	−0.316(−3.80)*	−0.090(−1.53)	−0.246(−3.05)*	−0.050(−0.97)
ΔINX_{t-1}	–	−0.20(−1.93)**	−0.473(−6.32)*	−0.503(−5.25)*	−0.430(−4.64)*	−0.216(−2.40)*
ΔINX_{t-2}	–	–	−0.431(−5.12)*	−0.242(−2.56)*	–	−0.409(−6.53)*
ΔINX_{t-3}	−0.146(−2.39)*	−0.188(−1.99)*	−0.394(−4.72)*	−0.252(−2.66)*	–	–
ΔINX_{t-4}	0.824(15.16)*	–	–	0.185(1.87)**	–	–
ΔINY	–	1.958(3.69)*	–	2.613(5.37)*	–	2.369(7.11)*
ΔINY_{t-1}	–	−1.822(−3.59)*	–	–	−0.875(−5.17)*	−1.519(−3.74)*
ΔINY_{t-2}	–	1.408(2.71)*	–	1.152(3.96)*	–	–
ΔINY_{t-3}	0.464(1.77)**	1.157(2.41)*	−2.125(−5.74)*	1.001(3.76)*	0.539(3.22)*	–
ΔINY_{t-4}	–	–	–	−1.598(−3.97)*	–	–
ΔINP	–	−0.625(−3.90)*	−0.588(−2.63)*	−0.488(−2.90)*	−0.365(−3.37)*	−0.500(−2.09)*
ΔINP_{t-2}	–	0.386(3.86)*	−0.753(−3.13)*	–	0.301(2.36)*	–
ΔINP_{t-3}	–	–	−0.820(−3.34)*	−0.379(−2.34)*	–	–
ΔINP_{t-4}	0.653(2.25)*	0.449(2.92)*	–	–	–	–
$\Delta INRER_{t-1}$	–	–	–	–	0.187(2.02)*	–
$\Delta INRER_{t-2}$	–	–	–	–	0.241(2.31)*	–
ΔINV	–	–	–	–	−0.898(−2.79)*	–
ΔINV_{t-1}	–	–	−2.243(−2.05)*	–	–	–
ΔINV_{t-2}	–	–	−2.372(−2.10)*	–	–	–
ΔINV_{t-3}	−3.221(−3.37)*	1.908(3.46)*	–	–	–	–
ΔINV_{t-4}	3.199(3.24)*	−1.343(−2.45)*	–	–	–	–
Adj. R^2	0.90	0.88	0.81	0.82	0.52	0.78
Jarque-Bera	12.8	9.18	2.69	0.92	3.15	0.45
AR(1)	1.34	0.15	0.002	0.61	1.71	0.30
AR(4)	3.43	0.33	1.42	0.71	0.58	1.08
ARCH(4)	2.34	0.82	0.73	0.31	0.88	1.01

Notes: The numbers in parentheses are *t*-statistics.
Asterisks (*) and (**) show significance at 5% and 10% levels, respectively.
Jarque-Bera is the test for normality of residuals.
AR (1) and AR(4) are F-tests for residual autocorrelation.
ARCH (4) is the F-test for autoregressive conditional heteroscedasticity.

for South Africa, the real exchange rate term significantly affects real exports.

A significant coefficient has not been found for the exchange rate volatility for South Korea and Turkey. This means that short-run impact of the exchange rate volatility is statistically insignificant. Utilization of forward exchange markets to fully hedge exchange rate risk may have made exchange rate volatility less of a factor in explaining real exports to these countries in the short-run. However for other countries, the exchange rate volatility significantly affects real exports. This suggests that exchange rate volatility is not only effective on real exports in the long run but it is also effective in the short run for other countries.

5. Conclusion

This paper examines the relationship between the volatility of exchange rates and flows of trade using data on six countries, namely, South Korea, Pakistan, Poland, South Africa, Turkey and Hungary. The moving standard deviation of the growth of the real exchange rate is employed to measure the exchange rate volatility. Cointegration and error correction models are respectively used to obtain the estimates of the cointegrating relations and the short-run dynamics. Our results suggest that there is a long-run relationship between real export, relative prices, real foreign demand, real exchange rate and exchange rate volatility. It is found that the exchange rate volatility reduced real exports for Poland, Pakistan, South Korea and South Africa and increased for Hungary and Turkey. We also found that exchange rate volatility is not only effective on real exports in the long run but it is also effective in the short run for all countries except South Korea and Turkey.

It is claimed that the degree of risk aversion is important in order to determine the effect of exchange rate uncertainty on exports. A producer who shows a low degree of risk aversion will prefer to export less since higher exchange rate volatility reduces the expected marginal utility of export revenue. If producers are sufficiently risk averse, an increase in exchange rate risk raises the expected marginal utility of export revenue and induces them to export more. In this situation, the producers in Poland, Pakistan, South Korea and South Africa shows a low degree of risk aversion and producers in Hungary and Turkey show a high degree of risk aversion. As a general comment, in developing countries, both the existence and the degree of exchange rate volatility should be considered by policymakers.

Notes

1. Surveys of the literature can be found in Cote (1994), McKenzie (1999), IMF (2004) and Ozturk (2006).

2. Cushman (1983, 1986, 1988), Akhtar and Hilton (1984), Kenen and Rodrik (1986), Thursby and Thursby (1987), De Grauwe (1988), Pere and Steinherr (1989), Pozo (1992), Savvides (1992), Koray and Lastrapes (1989), Acaravci and Ozturk (2002), Arize *et al.* (2000, 2005), Baak (2004), Das (2003), Vergil (2002), Rose (2000), Chowdhury (1993), Bahmani-Oskooee (2002), and Arize (1995, 1996, 1997).
3. McKenzie and Brooks (1997), and Vergil (2002) follow the same approach.
4. Das (2003) used this method to measure the volatility of exchange rate.

References

Acaravci, A. and I. Ozturk (2002), 'The Effects of Exchange Rate Volatility on the Turkish Export: An Empirical Investigation', *Review of Social, Economic & Business Studies*, Vol. 2, pp. 197–206.

Akhtar, M. and R. Spence Hilton (1984), 'Effects of Exchange Rate Uncertainty on German and U.S. Trade', *Federal Reserve Bank of New York Quarterly Review*, Vol. 9, pp. 7–16.

Aristotelous, K. (2001), 'Exchange-rate Volatility, Exchange-rate Regime, and Trade Volume: Evidence from the UK-US Export Function (1989–1999)', *Economic Letters*, Vol. 72, pp. 87–89.

Arize, A.C. (1995), 'The Effects of Exchange Rate Volatility on US Exports: An Empirical Investigation' *Southern Economic Journal*, Vol. 62, pp. 34–43.

Arize, A.C. (1996), 'The Impact of Exchange-rate Uncertainty on Export Growth: Evidence from Korean Data', *International Economic Journal*, Vol. 10, No. 3, Autumn, pp. 49–60.

Arize, A.C. (1997), 'Conditional Exchange Rate Volatility and the Volume of Foreign Trade: Evidence from Seven Industrialized Countries', *Southern Economic Journal*, Vol. 64, pp. 235–54.

Arize, A.C., J. Malindretos and K.M. Kasibhatla (2003), 'Does Exchange-Rate Volatility Depress Export Flows: The Case of LDCs', *International Advances in Economics Research*, Vol. 9, pp. 7–19.

Arize, C. A., T. Osang and J. D. Slottje (2000), 'Exchange Rate Volatility and Foreign Trade: Evidence from Thirteen LDCs', *Journal of Business and Economic Statistics*, Vol. 18, No. 1, pp. 10–17.

Arize, C. A., T. Osang, and J. D. Slottje (2005), 'Exchange-rate Volatility in Latin America and its Impact on Foreign Trade', September 2005. Available at: http://faculty.smu.edu/tosang/pdf/latin.pdf

Asafu-Adjeye, J. (1999), 'Exchange Rate Variability and Export Growth in Fiji', Asia Pacific School of Economics and Management Working Papers, No. 99-4.

Baak, S. (2004), 'Exchange Rate Volatility and Trade among the Asia Pacific', International University of Japan, 26 April. Available at: http://repec.org/esFEAM04/up.29293.1080736850.pdf

Bahmani-Oskooee, M. (2002), 'Does Black Market Exchange Rate Volatility Deter the Trade Flows? Iranian Experience', *Applied Economics*, Vol. 34, pp. 2249–55.

Bailey, M. J. and G. S. Tavlas (1988), 'Trade and Investment under Floating Rates: The U.S. Experience', *Cato Journal* (Fall), pp. 421–49.

Bailey, M. J., G. S. Tavlas and M. Ulan (1986), 'Exchange-rate Variability and Trade Performance: Evidence for the Big Seven Industrial Countries', *Weltwirtschaftliches Archiv*, Vol. 122, pp. 466–77.

Bailey, M. J., G. S. Tavlas and M. Ulan (1987), 'The Impact of Exchange Rate Volatility on Export Growth: Some Theoretical Considerations and Empirical Results', *Journal of Policy Modeling*, Vol. 9, No. 1, pp. 225–43.

Brada, J. C. and J. A. Méndez (1988), 'Exchange Rate Risk, Exchange Rate Regime and the Volume of International Trade', *KYKLOS*, Vol. 41, pp. 263–80.

Bredin, D., S. Fountas and E. Murphy (2003), 'An Empirical Analysis of Short Run and Long Run Irish Export Functions: Does Exchange Rate Volatility Matter?', *International Review of Applied Economics*, Vol. 17, pp. 193–208.

Chit, M. M. (2008), 'Exchange Rate Volatility and Exports: Evidence from the ASEAN-China Free Trade Area', *Journal of Chinese Economic and Business Studies*, Vol. 6, No. 3, pp. 261–77.

Chowdhury, A. R. (1993), 'Does Exchange Rate Volatility Depress Trade Flows? Evidence from Error Correction Models', *The Review of Economics and Statistics*, Vol. 76, pp. 700–706.

Clark, P. B. (1973), 'Uncertainty, Exchange Risk, and the Level of International Trade', *Western Economic Journal*, Vol. 11 (September), pp. 302–13.

Cote, A. (1994), 'Exchange Rate Volatility and Trade: A Survey', Working Paper 94–5, Bank of Canada.

Cushman, D. O. (1983), 'The Effects of Real Exchange Rate Risk on International Trade', *Journal of International Economics*, Vol. 15, pp. 45–63.

Cushman, D. O. (1986), 'Has Exchange Risk Depressed International Trade? The Impact of Third-country Exchange Risk', *Journal of International Money and Finance*, Vol. 5, pp. 361–79.

Cushman, D. O. (1988), 'U.S. Bilateral Trade Flows and Exchange Risk during the Floating Period', *Journal of International Economics*, Vol. 25, pp. 317–30.

Das, S. K. (2003), 'Effects of Exchange Rates Volatility on International Trade: An Empirical Analysis', Vanderbilt University, March 2003, Manuscript.

De Grauwe, P. (1988), 'Exchange Rate Variability and the Slowdown in Growth of International Trade', *IMF Staff Papers*, Vol. 35, pp. 63–84.

Doyle, E. (2001), 'Exchange Rate Volatility and Irish-UK Trade, 1979–1992', *Applied Economics*, Vol. 33, pp. 249–65.

Engle, R. and Granger, C. W. J. (1987), 'Cointeration and Error Correction: Representation, Estimation and Testing', *Econometrica*, Vol. 55, pp. 251–76.

Ethier, W. (1973), 'International Trade and the Forward Exchange Market', *American Economic Review*, Vol. 63 (June), pp. 494–503.

Franke, G. (1991), 'Exchange Rate Volatility and International Trading Strategy', *Journal of International Money and Finance*, Vol. 10, No. 2, pp. 292–307.

Gagnon, J. E. (1993), 'Exchange Rate Variability and the Level of International Trade', *Journal of International Economics*, Vol. 34, Nos. 3–4, pp. 269–87.

Gotur, P. (1985), 'Effects of Exchange Rate Volatility on Trade', *IMF Staff Papers*, Vol. 32, pp. 475–512.

Holly, S. (1995), 'Exchange Rate Uncertainty and Export Performance: Supply and Demand Effects', *Scottish Journal of Political Economy*, Vol. 42, pp. 381–91.

Hondroyiannis, G., P.A.V.B. Swamy, G. Tavlas and M. Ulan (2008), 'Some Further Evidence on Exchange-Rate Volatility and Exports', *Review of World Economics*, Vol. 144, No. 1, pp. 151–80.

Hook, L. S. and T. H. Boon (2000), 'Real Exchange Rate Volatility and Malaysian Exports to its Major Trading Partners', Working Paper 6, Universiti Putra Malaysia.

Hooper, P. and S. W. Kohlhagen (1978), 'The Effect of Exchange Rate Uncertainty on the Prices and Volume of International Trade', *Journal of International Economics*, Vol. 8, pp. 483–511.

IMF (2004), 'Exchange Rate Volatility and Trade Flows: Some New Evidence', IMF WorkingPaper, May.

Kasman, A. and A. Kasman (2005), 'Exchange Rate Uncertainty in Turkey and its Impact on Export Volume', *METU Studies in Development*, Vol. 32 (June), pp. 41–58.

Kenen, P. T. and D. Rodrik (1986), 'Measuring and Analyzing the Effects of Short-term Volatility in Real Exchange Rates', *The Review of Economics and Statistics*, Vol. 68, pp. 311–15.

Klein, M. W. (1990), 'Sectoral Effects of Exchange Rate Volatility on the US Exports', *Journal of International Money and Finance*, Vol. 9, pp. 299–308.

Koray, F. and W. D. Lastrapes (1989), 'Real Exchange Rate Volatility and U.S. Bilateral Trade: A VAR Approach', *Review of Economics and Statistics*, Vol. 71, pp. 708–12.

Mackinnon, J.J. (1991), 'Critical Values for Cointegration Tests', in R.F. Engle and C.W. Granger (eds.), *Long-run Economic Relationship: Readings in Cointegration*, Oxford University Press, Oxford, pp. 267–76.

McKenzie, M. D. (1998), 'The Impact of Exchange Rate Volatility on Australian Trade Flows', *Journal of International Financial Markets, Institutions and Money*, Vol. 8, pp. 21–38.

McKenzie, M. D. (1999), 'The Impact of Exchange Rate Volatility on International Trade Flows', *Journal of Economic Surveys*, Vol. 13, No. 1, pp. 71–106.

McKenzie, M. D. and R. Brooks (1997), 'The Impact of Exchange Rate Volatility on German–US Trade Flows', *Journal of International Financial Markets, Institutions and Money*, Vol. 7, pp. 73–87.

Ozturk, I. (2006), 'Exchange Rate Volatility and Trade: A Literature Survey', *International Journal of Applied Econometrics and Quantitative Studies*, Vol. 3, No. 1, pp. 85–102.

Pere, E., and A. Steinherr (1989), 'Exchange Rate Uncertainty and Foreign Trade', *European Economic Review*, Vol. 33, pp. 1241–64.

Pozo, S. (1992), 'Conditional Exchange Rate Volatility and the Volume of International Trade: Evidence from the Early 1990s', *Review of Economics and Statistics*, Vol. 74, pp. 325–29.

Rose, A. (2000), 'One Money, One Market: Estimating the Effect of Common Currency on Trade', *Economic Policy*, Vol. 30, pp. 7–45.

Savvides, A. (1992), 'Unanticipated Exchange Rate Variability and the Growth of International Trade', *Weltwirtschaftliches Archiv*, Vol. 128, pp. 446–63.

Sercu, P. and C. Vanhulle (1992), 'Exchange Rate Volatility, International Trade, and the Value of Exporting Firm', *Journal of Banking and Finance*, Vol. 16, No. 1, pp. 152–82.

Thursby, M. C. and J. G. Thursby (1987), 'Bilateral Trade Flows, Lender Hypothesis, and Exchange Risk', *Review of Economics and Statistics*, Vol. 69, pp. 488–95.

Vergil, H. (2002), 'Exchange Rate Volatility in Turkey and its Effect on Trade Flows', *Journal of Economic and Social Research*, Vol. 4, No. 1, pp. 83–99.