

## The Effect of Exchange Rate Volatility on the Imports of ECOWAS Countries

<sup>1</sup>Godwin Akpokodje and <sup>2</sup>Benson U. Omojimate

<sup>1</sup>Nigerian Institute for Social and Economic Research, Ojoo, Ibadan, Nigeria

<sup>2</sup>Department of Economics, Delta State University, Abraka, Nigeria

---

**Abstract:** The volatile nature of exchange rates especially since the demise of the Bretton Woods system of exchange rates and the consequent adoption of a flexible one was a major source of concern to developing countries. The anxiety principally was that exchange rates are more volatile in a floating regime, thereby constituting a source of risk to trade and can therefore, negatively affect imports which are critical to the growth of developing countries. The study investigates the effect of exchange rate volatility on the imports of ECOWAS countries over the 1986-2006 period during which the countries operated a flexible exchange rate system. An import model was estimated with exchange rate volatility as one of the independent variables. But as a prelude to this, the exchange rate volatility series were generated utilizing the GARCH model. Exchange rate volatility was found to negatively affect the imports of the panel of all ECOWAS countries. However, the effect on the sub-groups was mixed. While exchange rate volatility negatively affects the imports of the group of non-CFA countries, its effect on the group of the CFA countries is positive.

**Key words:** Imports, trade, regimes, African countries, instability

---

### INTRODUCTION

A major concern of policy makers at the demise of the Bretton Wood system is the consequence of exchange rate volatility perceived to be a prominent feature of a flexible exchange rate system. The premise is that exchange rate volatility makes firms to add risk premium to the cost of traded goods leading to higher prices and lower external trade. This has important implications for trade and growth prospects of countries. Indeed, exchange rate volatility is at the core of the raging debate on the performance of exchange rate regimes, a concern reinforced by the large movements in nominal exchange rates that characterized world financial markets since the move to a managed floating exchange rate system in 1973. These movements were accompanied by large swings in real exchange rates. Further, exchange rate volatility was substantially much higher than the early advocates of floating had expected (Hasan and Wallace, 1996; Bailey and Tavlas, 1988). Thus, the debate on the optimal management of exchange rates attracted renewed attention. It was enhanced by the possibility of a causal link between this increased volatility and the observed decline in the growth of trade.

Most African countries adopted economic reform programmes in the 1980s, with exchange rate liberalization as a major component. Exchange rates in Africa have been highly volatile since the adoption of the flexible exchange

rates. Exchange rate volatility ranged between 0.04 and 140% in 1973 and 2006, respectively and an average of 75% in 1973-2006. Correspondingly, imports growth fell from 6.7% in the 1970s to 2.7% in the 1980s. The perceived correspondence between exchange rate volatility and imports raise some pertinent questions. Is there any connection between exchange rate volatility and imports? If yes, what is the effect of exchange rate volatility on imports? What is the magnitude of this effect?

The study empirically investigates the effect of exchange rate volatility on the imports of ECOWAS countries. It is motivated by the theoretical and empirical inconclusiveness of the effects of exchange rate volatility on imports. Further, empirical evidence on the effect of exchange rate volatility on trade flows in Africa is very sparse. There exist only two panel data studies in this connection (Ghura and Greene, 1993; Sekkat and Varoudakis, 2000). However, these studies are limited by the period of observation employed and the risk measures adopted. Besides, they touch tangentially on exchange rate volatility. Moreover, previous studies employed pooled data of both fixed and flexible exchange rate periods. The use of such non-homogenous samples may unduly bias the results (De Grauwe, 1988; Himarios, 1989; McNown and Wallace, 1992; Arize and Walker, 1992).

The knowledge of the degree to which exchange rate volatility affects imports is important for the design of both exchange rate and trade policies. For instance, if

exchange rate volatility leads to a reduction in imports, trade adjustment programmes that emphasized import contraction could be unsuccessful if exchange rate is volatile. In addition, the intended effect of a trade liberalization policy may be doomed by a variable exchange rate and could precipitate a balance of payments crisis (Arize, 1998; Arize *et al.*, 2000).

**Trend in import:** Imports constitute an important component of the GDP of ECOWAS countries. Table 1 indicates that imports as a share of GDP hovered around 33.17% in the 1970s and 40.58% in 2000-06. On the average, import as share of GDP was about 26%. A few differences exist in the share of imports in GDP in the non-CFA and CFA countries. The first is that import share in GDP is relatively lower in the CFA countries. For instance, the average import share of 21.48% in the CFA countries during 1970-06 is lower than the annual average of 31.71% recorded for the non-CFA countries. Second, while the share of imports in GDP in the non-CFA countries has consistently been on the increase, CFA's share of imports in GDP has been fluctuating. In the non-CFA countries, for instance, import share rose from 33.59% in the 1970s to 43.41 and 48.72% in the 1990s and in 2000-06, respectively. But in the CFA countries, import share rose from 32.90% in the 1970s to 36.88% in the 1980s. This dropped to 31.12% in the 1990s and rose again in 2000-06 to 35.69%.

The trend of growth of imports of ECOWAS as a whole is shown in Table 2. The Table 2 reveals that import growth dropped substantially from 6.3% in the 1970s to 0.04% in the 1980s. Imports were however, resuscitated in the 1990s and 2000-06, with the growth of imports rising to 3.51% in the 1990s and 4.27% in 2000-06. The trend of growth of imports at the CFA and non-CFA levels appears to mirror that of the ECOWAS as a whole. For example, imports growth of the CFA countries dropped from 6.48% in the 1970s to 1.39% in the 1980s in line with that of ECOWAS as a whole but rose in the 1990s and in 2000-06. The non-CFA group had a similar experience. The major rise in the growth of imports in the 1990s and in 2000-06 could be attributed to the adoption of economic adjustment programmes by these countries. Trade liberalization was a significant component of these adjustment efforts. It is however, important to note that growth appears stronger in the non-CFA countries than in the CFA ones. Table 2 shows that the growth of imports in the non-CFA countries in 2000-2006 was about twice that of the CFA. This is not entirely surprising especially as imports faced relatively stiffer measures in the non-CFA countries prior to trade liberalization.

Table 1: Imports and share of GDP (%)

Period	ECOWAS	NCA	CFA
1970-06	25.79	31.71	21.48
1970-79	33.17	33.59	32.90
1980-89	35.72	33.87	36.88
1990-99	35.51	43.41	31.12
2000-06	40.58	48.72	35.69

Table 2: Growth of imports in CFA and non-CFA countries

Period	ECOWAS	CFA	Non-CFA
1970-06	4.11	4.08	4.18
1970-79	6.30	6.48	5.95
1980-89	0.04	1.39	-2.40
1990-99	3.51	2.69	5.00
2000-06	4.27	3.18	6.44

Computed employing International Monetary Fund, International Financial Statistics data

Despite the improved growth recorded in imports in ECOWAS, it is worth noting that the growth in imports in ECOWAS is substantially lower than those of other regions of the world. Table 3 indicates the growth of imports is about half of that of other regions of the world. Even in Africa, the growth of imports in ECOWAS countries is lower, except in 2000-2006.

A few of the ECOWAS countries performed better than the sub-regional annual average of 2.93% during 1986-2006. These include Ghana and Cape Verde that had growth rates of 8.21 and 7.45%, respectively (Table 4). Others are Gambia, Nigeria, Mali, Senegal and Burkina Faso though their growth rates were not as high as those recorded by Ghana and Cape Verde. The growth rates of imports of the remaining countries were less than the ECOWAS average.

The literature is replete with empirical evidence on the effect of exchange rate volatility on exports but sparse in regards to the effect on imports. The few existing studies on the impact of exchange rate volatility on imports are reviewed.

Hooper and Kohlhaugen (1978) investigation on the effect of exchange rate volatility on imports covered Germany, Japan, UK, US, Canada and France over the period 1965-1975. Measuring exchange rate volatility by the standard error of nominal exchange rate fluctuations, exchange rate volatility was found to have adverse effect on German imports.

For the other countries, the effect was positive though significant in only two. Cushman (1983) results were negative in 6 out of the 13 European countries. Exchange rate volatility was also discovered to depress imports by about 10% in the euro area during 1989-1999 by Anderton and Skudelny (2001).

Some studies adopted the GARCH approach in modelling exchange rate volatility. For example, Caporale and Doroodian (1994) used this method to investigate the effect of real exchange rate volatility on US

Table 3: Growth in imports in various regions (%)

Import growth					
Period	Africa	Asia	Developing	Industrial	ECOWAS
1970-06	7.96	14.50	11.88	10.24	4.11
1970-79	18.63	23.99	22.27	20.26	6.30
1980-89	3.44	12.27	6.92	7.19	0.04
1990-99	4.26	9.16	7.97	5.96	3.51
2000-06	3.30	12.08	10.70	6.01	4.27

Computed employing International Monetary Fund, International Financial Statistics data

Table 4: Average annual growth rate of imports (1986-2006)

Countries	(%)
Niger	-4.23
Guinea-Bissau	0.83
Guinea	1.35
Sierra Leone	1.64
Togo	1.72
Benin	2.08
ECOWAS	2.93
Cote d'Ivoire	2.99
Gambia, The	3.31
Nigeria	3.48
Mali	3.73
Senegal	3.92
Burkina Faso	4.55
Cape Verde	7.45
Ghana	8.21

World Development Indicators, 2007

imports from Canada over 1974-1992. The finding is that real exchange rate volatility significantly constrains US imports from Canada. Similar results have also been obtained for developing countries. For example, Siregar and Rajan (2004) obtained results that show that Indonesian imports (both aggregate and disaggregate) were constrained by exchange rate volatility in 1980-1997. Adopting the GARCH approach though to developing country, Ozbay (1999) found that exchange rate volatility induced imports in Turkey during 1987-1997. However, the impact was not statistically insignificant.

An import demand model was estimated by Pugh *et al.* (1999) employing the gravity model for the period 1980-1992 for 16 OECD countries. According to the import demand model, exchange rate volatility (measured as the standard deviation of the nominal exchange rate return) tends to reduce trade growth by around 10%. Exchange rate volatility was found to lead to a once for all decrease in the level of imports by around 8%.

The linkages between import flows and the real exchange rate volatility of 8 European countries namely Belgium, Denmark, Finland, France, Greece, the Netherlands, Spain and Sweden during the period 1973-1995 were explored by Arize (1998). Cointegration techniques based on Johansen's approach and robust single-equation methods were employed. The traditional specification of the equilibrium import demand model in

the flexible exchange rate environment was the model adopted. In this model, the desired real imports are a function of exchange rate volatility, income and relative prices. Exchange rate volatility was postulated to lead to higher import cost for risk-averse traders and to less foreign trade. Exchange rate volatility was discovered to have a significant negative effect on the volume of imports of six countries whereas, for Greece and Sweden, it is positive and significant.

The implications of exchange rate volatility for India's imports were the focus of Samanta (1998). The major innovation in this study is the adoption of two measures of risk. These are the standard deviation of the exchange rate, which the author defined as a short term measure of risk and a long term measure, which captures short and medium term deviations from the equilibrium exchange rates for both the past and present time periods. Employing the cointegration technique and utilizing data over the period, 1953-1989, the results of the import equation show that exchange rate risk exerted a significant positive influence on India's imports, thus implying that exchange rate risk induces imports.

Cointegration techniques were also used by Agolli (2003) to check countries short/long term evidence on the effect of exchange rate volatility on bilateral trade through pooled estimation. Exchange rate volatility was found to have positive impact on imports from Germany and Greece. The panel data estimates showed that exchange rate volatility had negative impact on the imports of Albania.

Distinct from the previous studies which employed the standard deviation of the exchange rate and its variants as the measure of exchange rate volatility, Rajan and Siregar (2002) used the conditional variance obtained through the GARCH model as the measures of exchange rate volatility within the context of an error correction framework to ascertain whether the increased exchange rate volatility of the Indonesian rupiah post 1997 may have been a cause for the country's poor import performance. Using quarterly data covering the period 1980-1997, the study found that exchange rate volatility adversely affected imports performance of Indonesia during the pre-crisis period.

While previous studies used the single equation technique, Sekkat (1997) adopted a simultaneous equation technique within the context of an error correction framework. It evaluated the impact of volatility on European trade during the period 1975-1994 utilizing the standard deviation of monthly exchange rate changes for a given year as the measure of volatility. The system of 5 equations was estimated using the three stage least square. Overall, exchange rate volatility was found to

have a negative impact in all the countries. However, the impact was statistically significant only on the imports of France.

The only study on Africa is that by Ghura and Greenes (1993), which investigates the impact of exchange rate misalignment and volatility on the trade flows of sub-Saharan African countries during 1972-1987. It employed the panel data approach. Gauging exchange rate volatility by the coefficient of variation of the real exchange rate, exchange rate volatility was found to have a more robust impact on imports than on exports. The study, however, focused exclusively on the fixed exchange rate era.

The review of the literature shows that there is paucity of studies on the African continent. Also, it reveals the lack of consensus on the impact of exchange rate volatility on imports.

## **MATERIALS AND METHODS**

**Theoretical framework:** The model by Clark (1973) is one of the earliest theories that examine the connection between exchange rate volatility and trade flows. It considers a competitive firm with no market power producing only one commodity, which is sold entirely to one foreign market and does not import any intermediate inputs. The firm is paid in foreign currency and converts the proceeds of its exports at the current exchange rate, which varies in an unpredictable fashion, as there are assumed to be no hedging possibilities, such as through forward sales of the foreign currency export sales. Moreover, because of costs in adjusting the scale of production, the firm makes its production decision in advance of the realization of the exchange rate and therefore, cannot alter its output in response to favorable or unfavorable shifts in the profitability of its exports arising from movements in the exchange rate. In this situation, the variability in the firm's profits arises solely from the exchange rate and where the managers of the firm are adversely affected by risk, greater volatility in the exchange rate with no change in its average level leads to a reduction in output and hence in exports, in order to reduce the exposure to risk. This basic model was elaborated by Hooper and Kohlhagen (1978), who also reached the same conclusion of a clear negative relationship between exchange rate volatility and the level of trade.

The strong conclusion of a negative effect of exchange rate volatility on trade flows by earliest studies was based on a number of simplifying assumptions. First, it is assumed that there are no hedging possibilities either through the forward exchange market or through offsetting transactions.

One reason why trade may be adversely affected by exchange rate volatility stems from the assumption that firms cannot alter factor inputs in order to adjust optimally to take account of movements in exchange rates. When this assumption is relaxed and firms can adjust one or more factors of production in response to movements in exchange rates, increased volatility can in fact create profit opportunities. This situation has been analyzed by Canzoneri *et al.* (1984) and Gros (1987), for example. The effect of such volatility depends on the interaction of two forces at research. On the one hand, if the firm can adjust inputs to both high and low prices, its expected or average profits will be larger with greater exchange rate volatility, as it will sell more when the price is high and vice versa. On the other hand, to the extent that there is risk aversion, the higher variance of profits has an adverse effect on the firm and constitutes a disincentive to produce and to trade. If risk aversion is relatively low, the positive effect of greater price volatility on expected profits outweighs the negative impact of the higher volatility of profits and the firm will raise the average capital stock and the level of output and trade.

Some authors have developed theoretical models in the context of the forward exchange market. For example, Barkoulas *et al.* (2002) developed a model in which exchange rate volatility had positive effect on imports. But the effect is adverse when the assumption of the existence of the forward exchange market is relaxed.

**Model specification:** Traditionally, the desired real imports are functionally related to exchange rate volatility, income and relative prices. The standard demand theory indicates that the partial derivative of the demand for imports with respect to the domestic income would be positive. For two reasons, real imports would be expected to increase with real income. First, if an increase in real income leads to an increase in real consumption, with an unchanged distribution of income, more foreign goods will be purchased. And if an increase in income leads to an increase in real investment, then investment goods not domestically produced must be bought from abroad. On the other hand, the effect of the real exchange rate on the demand for imports is negative. This implies that a depreciation of the real exchange rate will raise the cost of imports, all other factors held constant. This could lead to a decline in real imports demanded. Conversely, an appreciation of the real exchange rate will be reflected in a lower cost for imports leading to an increase in the volume demanded. Regarding the effects of exchange rate volatility, it has been argued that higher exchange rate volatility leads to higher import 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 changes in exchange rates become unpredictable, this creates uncertainty about the profits to be made and hence, reduces the benefits of trade.

Therefore, imports can be modelled as:

$$m = \sigma_0 + \sigma_1 \text{rer} + \sigma_2 y + \sigma_3 V + \phi \quad (1)$$

$(\sigma_1, \sigma_3 < 0; \sigma_2 > 0)$

where:

- m = Imports
- rer = Real exchange rate
- y = The domestic income
- V = Exchange rate volatility while
- $\phi$  = Error term

**Exchange rate volatility:** In line with recent literature, exchange rate volatility is measured using the GARCH model that provides a way of formalizing the fact that large changes in the exchange rates tend to be followed by large changes and then by small changes. This allows for prediction of the range of future movements of exchange rate. This approach is generally regarded as a better measure of exchange rate volatility.

**Estimation procedure:** The first step is to generate the exchange rate volatility series employing the GARCH approach. These generated series are then employed in the estimation of Eq. (1). The analysis is conducted for panels of non-CFA ECOWAS countries, CFA ECOWAS countries and the entire ECOWAS countries.

**Sources of data:** Time series data are collected for 1986-2006 covering the flexible exchange rate period. They are derived from international sources. Import, domestic gross domestic product and those of the foreign partners are derived from the World Bank African Database 2007 CD and supplemented by the World Bank World Development Indicators 2007 CD; exchange rates are obtained from the International Monetary Fund International Financial Statistics 2007 CD; the Economic Intelligence Unit (EIU) also provide pertinent country specific data.

## RESULTS

The discussions begin with the results of the entire ECOWAS countries panel (Table 5). Judging by the various descriptive statistics, the estimated import equation appears to have a good fit. For instance, the F-ratio statistic is highly significant. However, the explanatory ability of the equation measured by the adjusted  $R^2$  (that is the coefficient of determination) is

Table 5: Results of all selected countries' import equations

Variables	Fixed effects	Random effect
Constant	-	0.142 (0.135)
Exchange rate volatility	-0.003 (3.138)***	-0.022 (1.98)*
Real exchange rate	-0.024 (2.669)***	0.101 (2.881)***
Domestic income	0.874 (13.317)***	1.149 (6.991)***
Adj. R-squared	0.46	0.40
F	1.18***	-

The figures in parentheses are the t-values. \*\*\*, \*\* and \* show that estimated coefficients are significant at the 1, 5 and 10% levels, respectively

rather low. This could be suggesting that other relevant determinants of imports have been omitted. However, it should be noted that the relatively low value for the coefficient of determination is not atypical for a panel data study such as the Savvides (1992). The Hausman test results reject the unbiasedness of the random effect estimator at the 5% level. This implies that the random effects could be biased, suggesting that the fixed effects estimator is a better option. As a result, the discussions focus on the fixed effect results.

## DISCUSSION

Generally, the results of the import equation show that the coefficients have the expected signs. For instance, domestic income has a positive sign. It is also highly significant. The significantly positive effect of domestic income on imports shows that increasing income will raise the purchasing power of the citizens thereby empowering them to procure additional imported goods. The real exchange rate has a statistically significant negative effect on imports. A declining real exchange rate simply implies an appreciation of the nominal exchange rate. This leads to an increase in the price of imports and ultimately to a fall in local demand for imported goods. Exchange rate volatility significantly constrains imports in the sub-region. This finding suggests that the substitution effect of exchange rate volatility outweighs the income effect (De Grauwe, 1988).

The negative effect of exchange rate volatility on imports in the sub-region obtained in this study corroborates the findings of Ghura and Greenes (1993) that had earlier carried out a similar study for a sample of sub-Saharan African countries. However, the magnitude of the coefficient of imports reported in Ghura and Greenes (1993) is larger than that reported in this study. This could be due to differences in the number of countries covered, measurement of exchange rate volatility adopted and the period of coverage.

Next, are the panel results of the CFA and non-CFA countries (Table 6). Although, the coefficients of determination are low, they are comparable with and even better than those obtained by similar studies on Africa (Balassa, 1990; Ghura and Greenes, 1993; Sekkat and

Table 6: Results of the import equations of CFA and Non-CFA countries

Variables	CFA		Non-CFA	
	Fixed effects	Random effect	Fixed effects	Random effect
Constant	-	4.554 (3.491)***	-	2.042
Exchange rate volatility	0.054 (2.260)**	0.027 (2.451)**	-0.031 (2.911)***	-0.019 (2.103)**
Real exchange rate	-0.108 (6.084)***	-0.217 (2.611)***	-0.002 (0.067)	-0.070 (1.824)*
Domestic income	1.642 (20.348)***	1.422 (15.239)***	1.055 (12.086)***	0.818 (6.526)***
Adj. R-squared	0.582	0.465	0.40	0.32
F	1.85***	-	2.08**	-

The figures in parentheses are the t-values. The significances of the coefficients are indicated by \*\*\*, \*\*5 and \*10%

Varoukadis, 2000). The F-statistic is highly significant. Again, the Hausman test rejects the hypothesis that the random effect estimator is unbiased for the import equation in both panels.

The results of the estimated fixed effect import equation show that domestic income induces imports in both panels. The magnitude of the effect is however, larger in the CFA countries than in the non-CFA panel. The effect of the real exchange rate on imports is adverse in both panels, again suggesting that appreciation of the nominal exchange rate constrains imports in the countries concerned. However, the effect of exchange rate volatility in both panels differs. While exchange rate volatility constrains imports in the non-CFA panel, it induces imports in the CFA panel.

The positive effect of exchange rate volatility on imports in the CFA panel means that these group of countries will increase imports even in the face of rising exchange rate volatility and therefore cost of imports. This finding is in consonance with that of Medhora (1990) though the magnitude of the impact differs. The size of the effect obtained by Medhora (1990) is relatively larger though insignificant. It should, however, be pointed out that Medhora (1990) employed the nominal exchange rate in contrast to the real exchange rate variable adopted in this study. Moreover, the period of observation and the sample of countries differ. Other studies have also found exchange rate volatility positively affecting imports (Arize, 1998; Samanta, 1998; Ozbay, 1999).

## CONCLUSION

Exchange rate volatility has a statistically significant negative effect on the real imports of ECOWAS countries as a sub-region. However, the effect on the two major sub-groups is mixed. The effect on the CFA is positive while that on the non-CFA is negative. The negative effect of exchange rate volatility on the imports of the non-CFA countries could have serious adverse implications for output growth in these countries, especially as imports are critical in the production process. Exchange rate volatility, by curtailing imports could stifle the growth of the productive sectors (especially the manufacturing sector) with important

negative implications for employment and income generation. Consequently, policy actions are required to forestall this occurrence. A major action could be towards curbing the incidence of exchange rate volatility. In this connection, the adoption of a single exchange rate system as is the case in the CFA countries could be a way out. This could significantly assist in minimizing exchange rate volatility.

## RECOMMENDATIONS

ECOWAS countries should broaden their industrial base and promote agricultural expansion. Diversifying the economic base would improve earning capacities in ECOWAS countries and hence minimize the devastating effects of volatile export prices.

## REFERENCES

- Agolli, M., 2003. Exchange rate volatility effect on trade variations. Albanian Center for International Trade.
- Anderton, R. and F. Skudelny, 2001. The impact of exchange rate volatility on euro area imports. European Central Bank Working Paper Series.
- Arize, C.A., 1998. The effects of exchange rate volatility on US imports: An empirical investigation. *Int. Econ. J.*, 12 (3): 31-40.
- Arize, C.A. and J. Walker, 1992. A re-examination of aggregate import demand in Japan: An application of engle and granger two-step procedure. *Int. Econ. J.*, 6: 41-55.
- Arize, A.C., T. Osang and D. Slottje, 2000. Exchange rate volatility and foreign trade: Evidence from 13 LDCs. *J. Business Econ. Stat.*, 18: 10-17.
- Bailey, M.J. and G.S. Tavlas, 1988. Trade and investment performance under floating exchange rates: The US experience. IMF Working Paper, Spring.
- Balassa, B., 1990. Incentive policies and export performance in Sub-Saharan Africa. *World Development*, 18 (3).
- Barkoulas, J., C. Baum and M. Caglayan, 2002. Exchange rate effects on the volume and variability of trade flows. *J. Int. Money Finance*, 21: 481-496.

- Canzoneri, M.B., P.B. Clark, T.C. Glaessner and M.P. Leahy, 1984. The effects of exchange rate variability on output and employment. *International Finance Discussion Papers* 240.
- Caporale, T. and K. Doroodian, 1994. Exchange rate variability and the flow of international trade. *Econ. Lett.*, 46: 49-54.
- Clark, P.B., 1973. Uncertainty, exchange risk and the level of international trade. *West. Econ. J.*, 11: 302-13.
- Cushman, D.O., 1983. The effects of real exchange rate risk on international trade. *J. Int. Econ.*, 15: 43-63.
- De Grauwe, P., 1988. Exchange rate variability and the slowdown in the growth of international trade. *IMF Staff Papers*, 35: 63-84.
- Ghura, D. and T. Greene, 1993. The real exchange rate and macroeconomic performance in Sub-Saharan Africa. *J. Dev. Econ.*, 42: 155-174.
- Gros, D., 1987. Exchange rate variability and foreign trade in the presence of adjustment costs. Working Paper No. 8704, Département des Sciences Economiques, Université Catholique de Louvain.
- Hasan, S. and M. Wallace, 1996. Real exchange rate volatility and exchange rate regimes: Evidence from long-term data. *Econ. Lett.*, 52 (1): 67-73.
- Himarios, D., 1989. The impact of the exchange rate on US inflation and GNP growth: Comment. *Southern Econ. J.*, 55: 1044-1051.
- Hooper, P. and S. Kohlhaugen, 1978. The effect of exchange rate uncertainty on the prices and volume of international trade. *J. Int. Econ.*, 8: 483-511.
- McNown, R. and M. Wallace, 1992. Cointegration tests of a long-run relation between money demand and effective exchange rate. *J. Int. Money Finance*, 11: 107-114.
- Medhora, R., 1990. The effect of exchange rate variability on trade: The case of the west african monetary union's imports. *World Develop.*, 18 (2): 313-324.
- Ozbay, P., 1999. The effect of exchange rate uncertainty on exports: A case study for turkey. The Central Bank of The Republic of Turkey.
- Pugh, G., D. Tyrrell, P. Rodecki and L. Tarnawa, 1999. Exchange rate variability, international trade and monetary cooperation in Europe: Some quantitative evidence for the single currency debate, mimeo.
- Rajan, S.R. and R. Siregar, 2002. Impact of exchange rate volatility on Indonesia's trade performance in the 1990s. Centre for International Economics Studies CIES Discussion Paper 0205.
- Samanta, S., 1998. Exchange rate uncertainty and foreign trade for a developing country: An empirical analysis. *The Indian Econ. J.*, 45 (3).
- Savvides, A., 1992. Unanticipated exchange rate variability and the growth of international trade. *Weltwirtschaftliche Arch. Rev. World Econ. Band*, 128: 447-461.
- Sekkat, K., 1997. Exchange rate variability and EU trade. Final report to the commission of the EU DGII. 2nd Version.
- Sekkat, K. and A. Varoudakis, 2000. Exchange-rate management and manufactured exports in Sub-Saharan Africa. *J. Dev. Econ.*, 61 (1): 237-253.
- Siregar, R. and R.S. Rajan, 2004. Impact of exchange rate volatility of indonesia's trade performance in the 1990s. *J. Japanese Int. Econ.*, 18: 218-240.