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EXPORT PERFORMANCE AND EXCHANGE RATE VOLATILITY: EVIDENCE FROM THE WAMZ

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EXPORT PERFORMANCE AND EXCHANGE RATE VOLATILITY: EVIDENCE FROM THE WAMZ

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Abstract

This paper examines the relationship between exchange-rate volatility and export performance in the WAMZ countries using quarterly data for the period 1990-2010. The paper utilizes the Engel-Granger Dynamic OLS (DOLS) estimation technique as well as the Generalized Auto Regressive Conditional Heteroskedasticity (GARCH) approach to model the real exchange rate volatility. In conformity with theoretical considerations, the results indicate that increases in the exchange-rate volatility exert a significant negative effect upon export in Liberia, Nigeria and Sierra Leone. While a positive relationship is established in the case of The Gambia, exchange-rate volatility impact on Ghana and Guinea is insignificant. The results also reveal a positive relationship between terms of trade and export performance for all the countries, indicating that improvement in terms of trade trigger increases in export performance in the WAMZ countries. Income from the rest of the world is found to have a positive effect on export performance in the WAMZ countries. The study also finds that real effective exchange rate has a negative impact on export performance in the case of The Gambia, Ghana and Nigeria, while a positive relationship is established in the case of Guinea and Liberia. However, while a positive relationship is revealed for Sierra Leone in the long run, its impact in the short run is negative. A key lesson arising from this study is that trade policy actions aimed at stabilizing the export market are likely to generate uncertain results, at best, if policymakers in the WAMZ countries ignore the stability as well as the level of the real exchange rate. Thus, if policymakers wish to target exports, policies which will ensure stability of the exchange rate should be of outmost importance.

Key words: Exchange rate volatility, Engel-Granger Dynamic OLS, export performance, GARCH, WAMZ

1 *The authors are staff of the Research and Statistics Department of the West African Monetary Institute. The authors are grateful to the Technical Committee of the WAMZ, and staff of WAMI for their valuable comments. They also appreciate the comments of external reviewers. Finally, on behalf of WAMI, the authors are grateful to the African Capacity Building Foundation (ACBF) for the financial support in processing this report. The views expressed in the occasional paper are those of the authors and do not necessarily represent the views of WAMI. The occasional papers describe final reports of research studies prepared by the authors and presented to the Technical Committee during the WAMZ Convergence Council meetings*

1.0 INTRODUCTION

There has been widespread concern among trade economists and policymakers over the high degree of exchange rate volatility and its impact on export performance. Exchange rate volatility is a statistical measure of the tendency of the exchange rate to rise or fall sharply within a short period and it is important in understanding foreign exchange market behaviour. Exchange rate volatility creates uncertainty in macroeconomic policy formulation, investment decisions and international trade flows. From a theoretical point of view, the effect of exchange rate volatility on international trade is not unambiguous. This is because an increase in exchange rate risk has a substitution and an income effect. On the one hand, the substitution effect leads traders to substitute away from foreign trade towards domestic trade. It may be argued that a rise in exchange rate volatility increases the uncertainty of profits on contracts denominated in a foreign currency because this risk leads risk-averse and risk-neutral agents to redirect their activity from higher risk foreign markets to the lower risk home market. On the other hand, the income effect may leads to increase trade activity, since higher exchange rate volatility and thus higher risk represents greater opportunity for profit and might increase trade

After the collapse of the Bretton Woods system of fixed exchange rates in 1973, the West African Monetary Zone (WAMZ) countries amongst several countries adopted floating exchange rates system in order to reduce protectionist tendencies and promote trade as well as to gain overall macroeconomic independence, by bearing the burden of adjustment vis-à-vis imbalances in the current and capital accounts of the balance of payments. The transition to floating exchange rates and the nature and magnitude of the relationship between exchange rate volatility and trade flows have been a subject of major concern to economists. Like many developing countries, the WAMZ countries depend on the rest of the world and the level of interdependence has increased in the last decade. These countries are vulnerable to any adverse changes in other economies and changes over which they do not exercise any control. They have increasingly liberalized their trade frontiers leading to lower barriers to trade, for both goods and services. This has increased trade and intensified international competition.

The WAMZ countries consider exchange rate as a key macroeconomic policy instrument that enhances the country's competitiveness as well as export promotion and economic growth. The Central Banks of the WAMZ countries' exchange rate policies aim at providing an environment that promotes exchange rate stability and assists the government's objective of accomplishing export led growth. In line with this, the adoption of outward-looking trade policies ensured export growth that lead to long-term economic growth. The increased liberalization of trade and foreign exchange controls, exports promotion policies and multilateral trade agreements have led to greater penetration of WAMZ countries exporters to the international markets.

The empirical literature is inconclusive regarding the effect of exchange rate volatility on export growth. On the one hand, increasing exchange rate volatility, which is a major source of exchange risks, has significant and negative implications for the volume of trade flows and a country's balance of payments (Walters and De Beer, 1999; Bah and Amusa, 2003; Vergil, 2002). On the other hand, some studies provide evidence supporting a positive relationship between exchange rate volatility and trade flows (see, for example, De Grauwe, 1988; Asseery and Peel, 1991; Chowdhury, 1993; among others). De Grauwe (1988) for instance argues that if exporters are sufficiently risk-averse then an increase in exchange rate volatility results in an increase in expected marginal utility of export revenue that serves as an incentive to exporters to increase their exports in order to maximise their revenues. This lack of consensus amongst policymakers is reflected in the different exchange rate regimes that countries have pursued over time.

A major concern of policy makers following the collapse of the Bretton Wood System is the

consequence of exchange rate volatility, which is a prominent feature of the floating exchange rate. 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. Most African countries adopted economic reform programmes in the 1980s with exchange rate liberalization as a major component. Exchange rates in the WAMZ have been volatile since the adoption of the flexible exchange rate. For instance, real exchange rate volatility decline from 53.0% in 1991 to 45.6% in 2008. Correspondingly, export growth rose from 4.4 % to 9.7% during the same period (Source of data?). The perceived correspondence between exchange rate volatility and export performance in the WAMZ raises some pertinent questions. Is there any relationship between exchange rate volatility and export performance? If yes, what is the effect of exchange rate volatility on export in the WAMZ countries and what is the magnitude of this effect?

The objective of this paper is to empirically examine the relationship between real exchange rate volatility and exports performance in the WAMZ countries. Knowledge of the degree to which exchange rate volatility affects export is important for the design of both exchange rate and trade policies. For instance, if exchange rate volatility leads to a reduction in exports, trade adjustment programmes that emphasized export expansion could be unsuccessful if exchange rate is volatile. To achieve this objective the paper utilizes the Engel-Granger Dynamic OLS (DOLS) estimation technique. In addition, in measuring real exchange rate volatility, the Generalized Autoregressive Conditional Heteroskedasticity (GARCH) approach was employed.

The rest of the paper is organized as follows: following the introduction, section II consists of an overview of the linkage between the real exchange rate volatility and exports from the theoretical aspects as well as empirical evidence. Section III provides an overview on real exchange rate volatility and export performance in the WAMZ. In section IV, the theoretical framework is presented and the econometric model specified. The sources of data sets are presented in this section. Section V presents the estimation techniques, and discusses the empirical results, while section VI presents the concluding remarks and policy implications.

2.0 LITERATURE REVIEW

2.1 Real Exchange Rate Volatility and Exports: A Theoretical Perspective

The breakdown of the Bretton Woods exchange rate regime in 1973, and the subsequent emergence of more flexible exchange rate arrangements, triggered a lot of concern about increased exchange rate risk and its impact on exports. Most studies found fairly systematic evidence on the increased volatility of real exchange rates in both developing and developed countries. Effects of exchange rate volatility on trade flows are analysed in terms of risk or uncertainty. Exporters are either very risk-averse or less risk-averse and therefore would react differently to changes in real exchange rates. Hooper and Kohlhagen (1978) and IMF (1984) postulate that if agents are risk-averse an increase in exchange rate volatility induces them to reduce the volume of trade and reallocate production towards domestic markets.

De Grauwe (1988) argues that a rise in real exchange rate fluctuations can either have a positive or a negative effect on the volume of trade as it depends on the substitution and income effects. The substitution effect leads risk-averse agents to decrease export activities as the expected marginal utility of export revenues decreases. The less risk-averse group views the increase in exchange rate volatility in terms of greater risk. More real exchange rate volatility would prompt this category of exporters to reduce exports and divert resources to other sectors. On the other hand, the income effect causes risk-averse agents to increase exports to avoid severe fall in revenues. If agents are sufficiently risk-averse, an increase in risk associated with higher exchange rate volatility raises the expected utility of export revenue and induces exporters to export more to avoid a possibility of a reduction in their revenues. If the income effect offsets the substitution effect, there will be a positive link between exchange rate volatility and trade. Alternatively, an increase in risk will have a negative impact on trade. Earlier models based on the case of an exporter that takes production decisions before knowing the realization of exchange rates and cannot hedge this source of risk predicted that an increase in volatility negatively affected a risk-averse exporter (Clark (1973)). Under these assumptions, exports would increase with exchange rate volatility the greater the income effect and be depressed if the substitution effect outweighs the income effect. Ultimately, the effect of real exchange rate volatility on exports is ambiguous (Fountas and Aristotelous, 1999a/b; Cote, 1994).

Franke (1991) and Sercu and Vanhulle (1992) have shown that exchange rate variability can affect trade volume positively. Higher risk present greater opportunity for profits and, thus exchange rate volatility, to the extent that it increases risk, will increase trade. Thus, an increase in exchange rate variability will improve export performance as firm will exercise the option to export and thus increase the volume of trade. Pindyck (1982) has also shown that, under certain conditions, increased price variability can result in increased average investment and output as the firm adjusts to take advantage of high prices and to minimize the impact of low prices. Brada and Mendez (1988), from a political economy perspective, are of the opinion that movement in exchange rates can insulate the Balance of Payments from external shocks, thereby reducing the use of restrictions on trade and capital controls to attain equilibrium. The effect of this is that international trade is encouraged, even in the face of increasing exchange rate volatility.

Cote (1994), on the other hand, states that exchange rate volatility depresses trade. This occurs because markets may be imperfect particularly in less developed countries and also because hedging may not only be imperfect but also very costly as a basis for averting exchange risk. Thus, according to risk-aversion hypothesis, exports may be negatively correlated with exchange rate volatility. In addition, Arize *et al* (2000), Hooper and Kohlhagen (1978) argue that higher exchange rate volatility will depress trade volume through a rise in adjustment costs like irreversible investment due to higher uncertainty and risks. Chit (2008) posited that where hedging opportunities are non- existent or extremely expensive, risk adverse firms that must first decide on their export volumes before any uncertainty in

exchange rate is resolved will nearly always experience a negative relationship between exchange rate volatility and exports.

2.2 Real Exchange Rate Volatility and Exports: Empirical Evidence

The absence of a consensus from the point of view of theory has motivated many researchers over the years to undertake empirical studies on the subject matter. However, differences in country coverage, sample periods, models and estimation techniques, which have evolved over time with the advancement in econometrics, have made it impossible to establish a consensus and truly systematic relationship between exchange rate volatility and exports.

Chowdhury (1993) investigated the impact of exchange rate volatility on the trade flows of the G-7 countries in context of a multivariate error-correction model. They found that the exchange rate volatility had a significant negative impact on the volume of exports in each of the G-7 countries. In a related study, Mahmood, and Vixathep (2002) investigated the impact of exchange rate volatility on exports in four East Asians countries (Hong Kong, South Korea, Singapore, and Thailand). Their results indicated that exchange rate volatility has negative impacts on exports in both the short and long runs. Using an error-correction approach, Callabero and Corbo (1989) investigated the effect of real exchange rate uncertainty on exports for six developing countries (Chile, Colombia, Peru, Philippines, Thailand and Turkey). Their study found that real exchange rate uncertainty did reduce exports in the short-run and the results were substantially magnified in the long-run. In a related study, Samanta (1998) adopted a cointegration technique in examining the implications of exchange rate volatility for India's export. The results showed that over the period, 1953-1989, exchange rate risk had a significant adverse impact on exports. The results are similar to those obtained by Hassan and Tufte (1998) for Bangladeshi's aggregate exports over the period 1977-1992.

Qian and Virangis (1994) also examine the impact of exchange rate volatility on trade in six advanced countries, using ARCH to approximate volatility and monthly data from 1973 to 1990. Their results show a negative link between exchange rate volatility and export volumes for Australia, Canada, and Japan, while for United Kingdom, Sweden, and Netherlands there is a positive relationship. Also De Vitta and Abbott (2004) observe that short-term volatility in exchange rate does not affect UK exports to the EU both at the aggregate and sectoral levels. However, there are significant negative effects of long-term volatility on UK exports to the EU. The negative link is attributed to the difficulty to hedge against long-run fluctuations. A study by Alam (2011) using Autoregressive Distributed Lags (ARDL) technique shows that real exports are cointegrated with foreign economic activity, real effective exchange rate and volatility of real effective exchange rate in Pakistan. Real effective exchange rate and its volatility are found to have separate significant negative coefficients, implying that volatility adversely affected the Pakistan's aggregate exports from 1979 to 2005.

Ghura and Greenes (1993) employed a panel data technique in exploring the effect of exchange rate volatility on the trade flows of sub-Saharan Africa countries. Gauging exchange rate volatility by the coefficient of variation and utilizing data covering the period 1972-1987, the study found that exchange rate volatility had a significantly negative and robust impact on trade flows. Using quarterly observations over a twenty-year period in a vector co-integration model, Aliyu (2008) provided evidence of an inverse relationship between these variables. Specifically, the study revealed that volatility in the Naira exchange rate led to a 3.65 percent decrease in Nigeria's non oil exports. Bah and Amusi (2003) used ARCH and GARCH models to examine the effect of real exchange rate volatility on South African exports to the U.S. for the period 1990:1- 2000:4. The findings are that Rand's real exchange rate variability exerts a significant and negative impact of exports both in the long and short runs.

Other studies have found positive relationship between real exchange rate volatility and export performance. The studies by Cushman (1986), De Grauwe (1988), and Bini-Smaghi (1991), using time series data, for a group of industrialized economies found significant evidence in support of a positive relationship. Todani and Munyama (2005) employed ARDL bounds testing procedure on quarterly data for the period 1984-2004 to examine the impact of exchange rate variability on aggregate South African exports to the rest of the world as well as on goods, services and gold exports. They employed the moving average standard deviation and GARCH (1, 1) as measures of variability. The results indicate the existence of a significant positive relationship. By adopting the Johansen co-integration approach over a thirty three (33) year period between 1970 and 2003, Yusuf and Edom (2007), showed that depreciating the official exchange rate led to an increase in the export of round wood and sawn wood in Nigeria. Using annual data from 1970-1997 on a sample of 104 (developed and developing) countries, and employing a gravity model that took endogeneity into account, Rose (2000) found that volatility had an insignificant effect on trade. Tenreyro (2004), however, cast some doubt on the robustness of Rose's results.

The aforementioned surveys conclude that, from a theoretical perspective, there is no unambiguous response in the level of trade to an increase in exchange rate volatility because differing results can arise from plausible alternative assumptions and modeling strategies. The same ambiguity pervades much of the empirical literature, which may reflect the lack of clear-cut theoretical results as well as the difficulty in arriving at an appropriate proxy for exchange rate risk. The theoretical underpinnings are premised on the attitude of the exporters to risks, opportunities to hedge exchange rate risks, market structure, and adjustment costs. It is our view therefore that the relationship between exchange rate volatility and exports is analytically indeterminate. For this reason, the direction and size of the impact of exchange rate uncertainty on exports in the West African Monetary Zone (WAMZ) must be empirically studied before any valid conclusions are drawn. Understanding the direction and magnitude of the impact of exchange rate volatility on trade in the WAMZ is, no doubt, an important issue in the integration process.

3.0 REAL EXCHANGE RATE VOLATILITY AND EXPORT PERFORMANCE IN THE WAMZ

This section discusses the joint behaviour of real exchange rate volatility and export performance in the WAMZ. Specifically, we review episodes of real exchange rate volatility as it affects export performance in the WAMZ economies.

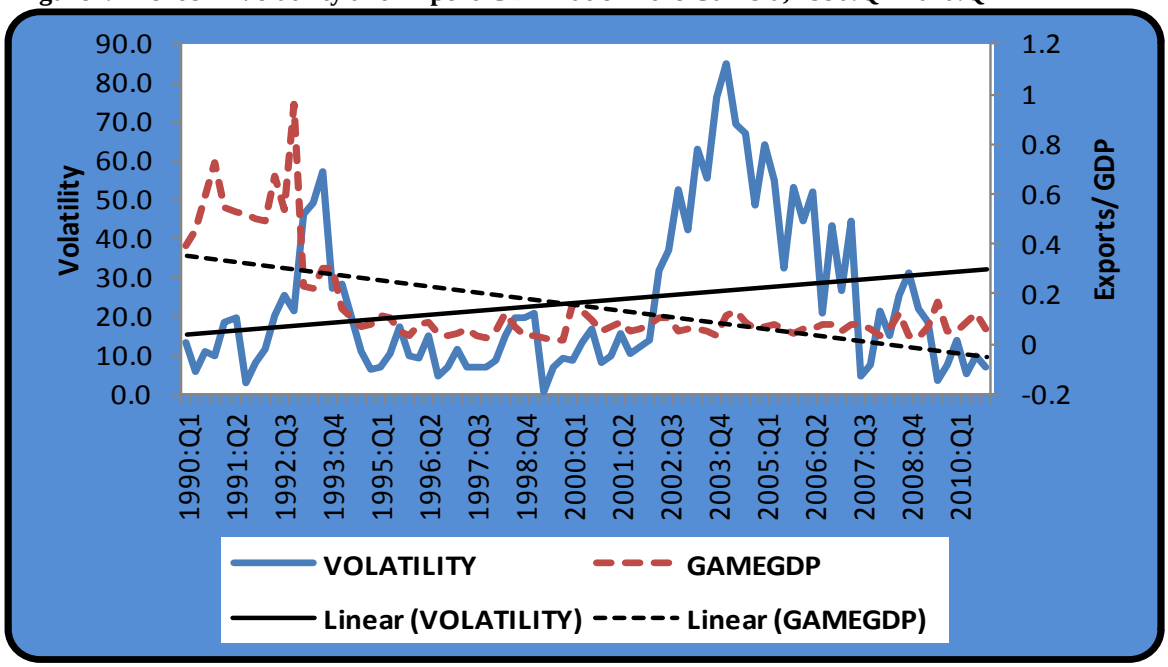
3.1 The Gambia

As an open economy, The Gambia considers the exchange rate as an important policy instrument for export promotion and economic growth. The current exchange rate policy of the Central Bank of the Gambia is aimed at providing an environment that promotes exchange rate stability and assists the government's objective of accomplishing export-led growth. The Gambian economy operated a fixed exchange rate between 1965 and 1985, during which time the dalasi was pegged to the pound sterling. However, following the waves of a Structural Adjustment Programme, the country adopted a floating (market determined) exchange rate in 1986, which resulted in a 28 percent drop in the real effective exchange rate (RER). After the change over to a floating exchange rate regime, the RER stayed within $\pm$ 10 percent band of its period average from 1986 to 2000, during which period a moderate nominal appreciation of the dalasi was offset by a negative inflation differential with partner countries.

The Gambia has long been a trade hub and re-exporter for the sub-region due to its relatively low import taxes, well-functioning port and customs services, and limited administrative barriers. Furthermore, the increased liberalization of trade and foreign exchange controls following the implementation of the Economic Recovery Programme in 1985 has boosted the country's export sector. About 80 percent of Gambian merchandise exports consist of re-exports to the sub-region - goods imported into The Gambia and transported unofficially into Senegal and beyond (Diagnostic Trade Integration Study, 2007). Groundnuts remain the country's main cash crop engaging directly or indirectly over 80 percent of the population.

Figure 1 shows that the real exchange rate was volatile during the period 1990-2010. It is evident from the figure that volatility had a linear upward trend during the study period, while exports-GDP ratio trended downwards. Between 1990 and 1994, real exchange rate volatility was trending upwards depicting period of real exchange rate depreciation. During this period, there was an increase in the export-GDP ratio, indicating that the high volatility (depreciation of the real exchange rate) probably improved export performance in the Gambia. However, between 1995 and 2001, the country experienced episodes of low volatility, reflecting real exchange rate appreciation. This period also coincided with a decline in export-GDP ratio, implying that the low volatility probably caused a decline in export performance. The figure also revealed that between 2002 and 2006, the country experienced high episode of real exchange rate volatility as the real exchange rate depreciated during this period. This period coincided with rapid depreciation of the dalasi. However, since 2007, the volatility eased off as the real exchange rate experienced mild appreciation. Despite the increased volatility of the real exchange rate since 2002, export performance remained relatively stable. However, exports-GDP ratio was above its trend between 2003 and 2010. In summary, a closer observation indicates that the periods when volatility was above its long-term trend coincided with those periods when exports-GDP ratio was also above its long-term trend, and vice versa.

Figure1: Trends in Volatility and Export-GDP Ratio in the Gambia, 1990:Q1-2010:Q4



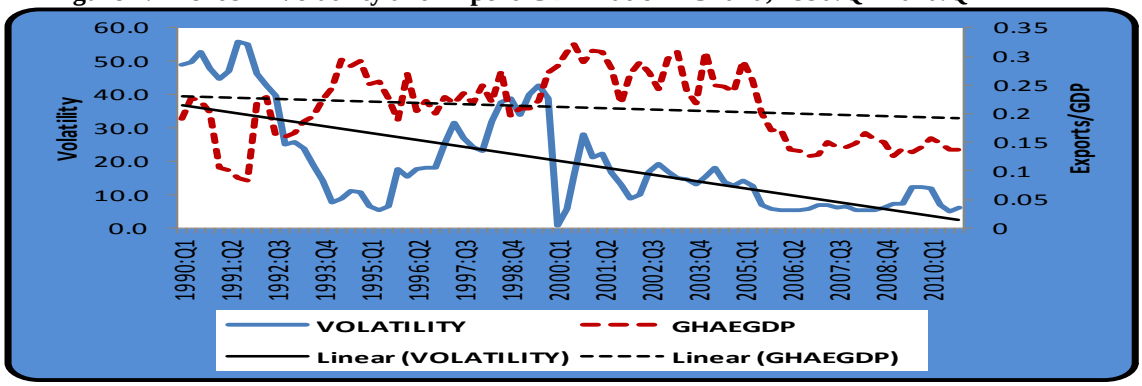
Source: Authors' compilation

3.2 Ghana

The Ghanaian economy adopted a fixed exchange rate regime in the management of its exchange rate between 1970 and 1982. During this period, the Ghanaian cedi was pegged to the main convertible currencies, notably the British pound and the American dollar. The country however launched an Economic Recovery Programme (ERP), aimed at the rationalisation of exchange rate to stimulate exports, and "getting the prices right" in order to redirect resources towards the more productive sectors of the economy. During this period, the government made series of devaluations of the cedi between 1983 and 1986. The country adopted a managed floating exchange rate in 1986, and in September of the same year, the government adopted an auction market approach in order to accelerate the adjustment of the exchange rate and to achieve the object of trade liberalization, leaving it partially to market forces (demand and supply) to determine the cedi-dollar rates (source).

A review of Figure 2 indicates that the real exchange rate had witnessed episode of volatility during the study period. Thus, between 1990 and 1992, the country's real exchange rate was marked with period of high volatility. This period was also characterized by a decline in export-GDP ratio, depicting that real depreciation caused a decline in export performance. Furthermore, between 1993 and 1997, the real exchange rate volatility was below its trend line, representing period of real exchange rate appreciation. During this period, Ghana's export-GDP increased and was above its trend. However since 2001, the real exchange rate volatility trended downward, while export-GDP ratio increased between 2000 and 2005, and thereafter declined gradually. This revealed that, while real exchange rate was appreciating, export-GDP initially increased and declined beyond 2005.

Figure 2: Trends in Volatility and Export-GDP Ratio in Ghana, 1990:Q1-2010:Q4

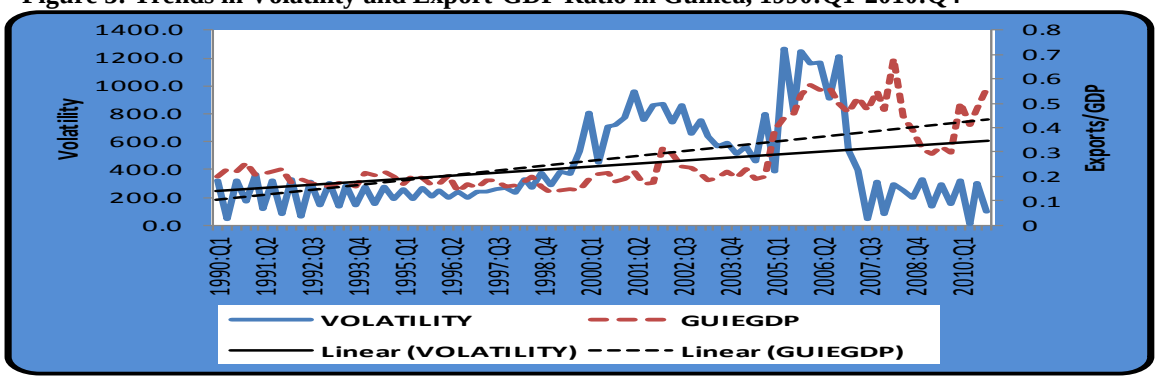


Source: Authors' compilation

3.3 Guinea

Three phases of exchange rate management can be distinguished in the evolution of the real exchange rate in Guinea. After achieving independence, Guinea adopted its own currency, the Guinean Syli (GS), which was pegged to the SDR on June 11, 1975 at the rate of GS 24.68 per SDR. The currency became increasingly overvalued, and, by mid-1985, its rate exceeded GS 280 per SDR in the parallel market. With a view to attracting foreign exchange to official channels, the government created a second market for foreign exchange in October 1985. In 1986, the Syli was replaced by the Guinean franc (GF) at GF 300 per U.S. dollar in the official market and GF 340 per U.S. dollar in the second market, in which the exchange rate was set at weekly auctions for foreign exchange organized by the central bank. In October 1994, the authorities adopted a flexible exchange rate regime and introduced an interbank market for foreign exchange. During 2000-02, the shortage of foreign exchange in the official market forced the central bank to move from weekly to monthly auctions in an effort to increase the volume offered at each auction. Between late 2002 and mid-July 2004, the authorities pegged the official exchange rate against the U.S. dollar and increasingly used the auction mechanism as an administrative vehicle to allocate foreign exchange. Since 2005, the central bank abandoned the official foreign exchange auction mechanism and liberalized the foreign exchange market. Since 2005, the official exchange rate has been determined weekly by a reference rate calculated as an arithmetic average of rates quoted by deposit banks and authorized non-bank foreign exchange bureaus.

Figure 3: Trends in Volatility and Export-GDP Ratio in Guinea, 1990:Q1-2010:Q4



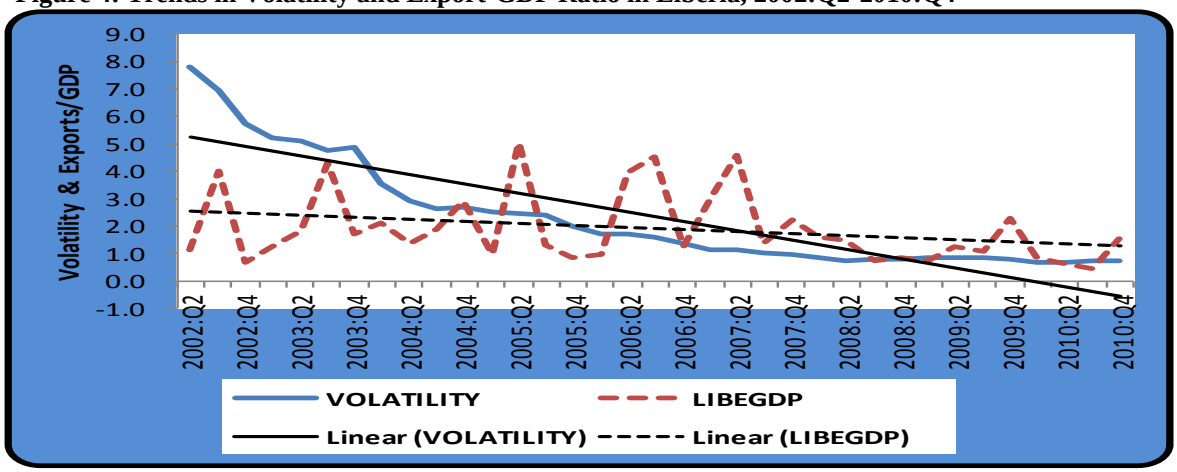
Source: Authors' Design

Given these developments, the country had experience series of volatility in its real effective exchange rate (Figure 3). Between 1990 and 2000, real exchange rate volatility was below its trend line denoting a real appreciation. In terms of export performance, export-GDP ratio increased above its trend line between 1990 and 1992, but increased between 1993 and 1998. However, the country experience episode of real depreciation between 2000 and 2007, with volatility far above its trend line. During this period, export-GDP ratio increased gradually. It is also evident from Figure 3 that, while volatility declined sharply in 2007 and thereafter remained below its trend line, export-GDP ratio remained high, indicating that real appreciation probably leads to an increase in export performance during the study period.

3.4 Liberia

Liberia has a cash-based economy with two legal tender- the Liberian national currency (Liberian dollar) and the United States dollar. But the two currencies are held for different purposes. While the Liberian dollar is held for small purchases and mostly used by government to pay civil servants' salaries, the United States dollar is used in trade and financial transactions. The level of dollarization remained high. The country is operating a managed float, where there is no predetermined path and the authorities only intervene to even out any large fluctuations in the currency. The Liberian dollar depreciated gradually in 2009, reflecting attempts by the Central Bank to balance the available foreign exchange against a sustained current-account deficit.

Figure 4: Trends in Volatility and Export-GDP Ratio in Liberia, 2002:Q2-2010:Q4



Source: Authors' Compilation

Critical analysis of Figure 4 revealed that real exchange rate volatility in Liberia experienced a decreasing trend during the study period. Between 2002 and 2003, real exchange rate volatility was above its trend line and during this period, export-GDP ratio also fluctuated around its trend line. However, between 2004 and 2008, real exchange rate volatility was below its trend line representing a real appreciation, while export-GDP growth was above its trend line for most of the period. Intuitively while there was real appreciation of the exchange rate, export-GDP ratio increased, on average, during this period. Between 2009 and 2010, real exchange rate volatility stabilized and was above its trend line. During this period, export-GDP ratio also declined and was below its trend line except in the last quarter of 2009 which saw a sharp rise in export-GDP ratio above its trend line.

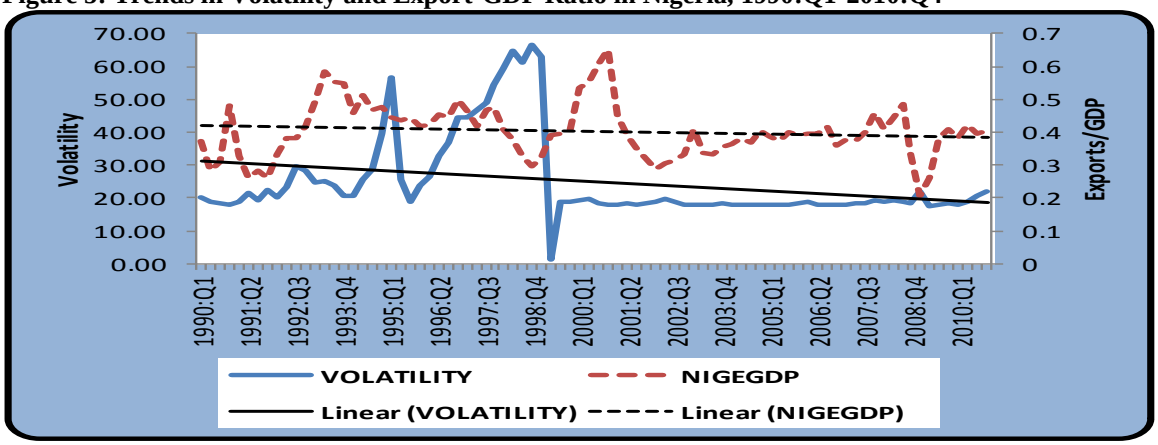
3.5 Nigeria

Prior to the policy reforms in 1986, and especially during the 196Os, Nigeria was known mainly as an exporter of primary agricultural commodities and, to a relatively small extent, as an exporter of one or two solid minerals. The country's foreign exchange rate was fairly stable from 1980 to 1985. In 1986, the government adopted the Structural Adjustment Programme (SAP) as a strategy to achieve sustainable growth path, through structural and sectoral policy reforms. One of the cardinal points of this policy was the floating nominal exchange rate policy. As the naira was allowed to float, the nominal exchange rate movement became more pronounced, contributing to stronger movements in exchange rate during this period. The introduction of the SAP in 1986 depreciated the naira. From 1986 to date the Nigeria's exchange rate management has gone through various stages of policy options. The first move started with the introduction of Second-Tier Foreign Exchange Market (SPEM) which was launched in on September 26, 1986. At its commencement, a dual exchange rate system for allocation of foreign exchange was adopted. There was a policy reversal in 1994 when the naira exchange rate was again pegged.

Another era of liberalization in the foreign exchange market began in 1995 when the Autonomous Foreign Exchange Market (AFEM) was introduced. During this period, the Central Bank of Nigeria (CBN) sold foreign exchange to end-users through selected authorized dealers at market-determined exchange rate. The country also introduced, an Inter-Bank Foreign Exchange Market (IFEM) October 25, 1999, but this was replaced by the Dutch Auction System (DAS) in 2002. This success was capped with further liberalization of the foreign exchange market in 2006 with the introduction of Wholesale Dutch Auction System (WDAS) to deepen the market and further close the market premium.

Despite the successful implementation of these different exchange rate regimes, a cursory examination of Figure 5 revealed that the real exchange rate fluctuated during the period under review. The real exchange rate experienced high volatility between 1990 and 1999, with the real exchange rate depreciating during this period. On average, export-GDP ratio increased during the same period. However, since 2000, the real exchange rate was relatively stable, fluctuating marginally. Despite the relative stability in the real exchange rate, export-GDP ratio has been below its trend line in recent years, suggesting that the non-oil export sector in Nigeria has been performing below average in recent times.

Figure 5: Trends in Volatility and Export-GDP Ratio in Nigeria, 1990:Q1-2010:Q4



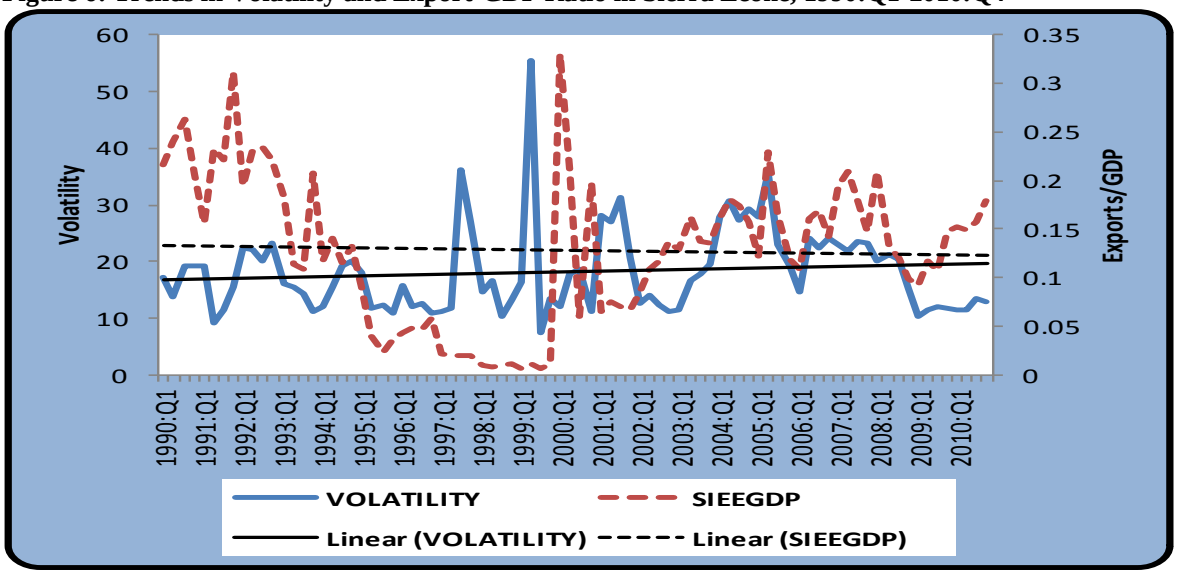
Source: Authors' Compilation

3.6 Sierra Leone

As in the case of many developing countries, Sierra Leone continued the use of the fixed exchange rate regime after the collapse of the Bretton Woods System in the early 1970s. However, with the experience of persistent deficit in the balance of payments, series of exchange rate adjustments were adopted in the 1980s. In 1986, Sierra Leone adopted a floating exchange rate system following the introduction of SAP. During this period, the government revalued the leone from Le53=$1 to Le23 =$1. The adoption of the floating exchange rate was aimed at increasing the competitiveness of the country's export, while maintaining a stable exchange rate with minimal volatility. Thus, in April 1991, a "manage float" was introduced as the previous fixed regimes had encouraged the smuggling of diamonds, gold and other exports abroad due to the huge overvaluation of the leone. In this system, the exchange rate was determined by market forces but has been modified by intervention of the authorities from time to time to regulate the exchange rate so as to avoid excessive depreciation of the domestic currency. This is being done through a weekly foreign exchange auction by the central bank.

Notwithstanding this development, Figure 6 revealed that the real exchange rate witnessed periods of volatility. It is evident from the figure that between 1990 and 1995 real exchange rate volatility was declining, while export-GDP ratio was above its trend line. This revealed that in the presence of real appreciation of the exchange rate, the country experienced improved export performance. In addition, between 1997 and 1999, the real exchange rate depreciated, causing volatility to increase, while export-GDP ratio decline gradually. The figure also showed that since 2003, both exchange rate volatility and export-GDP remained above their trend lines, denoting that depreciation of the exchange rate improved the country's export performance.

Figure 6: Trends in Volatility and Export-GDP Ratio in Sierra Leone, 1990:Q1-2010:Q4



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4.0 THEORETICAL FRAMEWORK AND METHODOLOGY

4.1 Export Function

In a simple Keynesian framework, export is modelled as a function of real exchange rate, terms of trade and income of the rest of the world. Thus, the basic export demand function can be specified as

$$EXP = f(RER,\ TOT,\ YROW) \quad (1)$$

Where *EXP* is defined as the ratio of export to GDP, *RER* = real effective exchange rate, TOT = terms of trade, and *YROW* = income in the rest of the world. Real exchange rate appreciation (lower real exchange rate) means loss of international competitiveness and, hence, a fall in demand for export, while a depreciation implies competitiveness gains and, therefore, a rise in demand for exports. It means that for a higher real exchange rate, the export of a home country is more competitive in comparison with the foreign country and lead to more exports. The terms of trade variable is the relative price of exports to price of imports. Thus, a rise in TOT implies favourable terms of trade which should induce more exports from the home country, and vice versa. All other things being equal, a rise in the income of the rest of the world would induce and increase demand for the home country's exports.

From opportunistic perspective, exchange rate fluctuations/volatility can influence export supply of a country. Further, any export performance model of a country must take into consideration both demand and supply side factors. Thus, equation (1) can be restated as

$$EXP = f(RER, TOT, YROW, VOL) \quad (2)$$

Where VOL is defined as real effective exchange rate volatility, while other variables are as defined earlier. The literature suggests that exchange rate volatility may have positive or negative impact on exports performance. The empirical modelling of export performance necessitates the introduction of a stochastic term into the export function. Thus, equation (2) can be re-specified in linear form as:

$$EXP_t = \beta_0 + \beta_1 RER_t + \beta_2 TOT_t + \beta_3 YROW_t + \beta_4 VOL_t + \varepsilon_t \quad (3)$$

Equation (3) is the empirical model to be estimated in this study. *A priori*, the coefficients are likely to have the following signs: $\beta_1 > 0, \beta_2 > 0, \beta_3 < / > 0, \beta_4 < / > 0$. Vol is defined in equation (5), while RER is defined in equations (4) and (6)

4.2 A GARCH Model of Exchange Rate Volatility

Real exchange rate fluctuations have been modelled differently in the literature. Some studies used moving average standard deviation while others used ARCH and GARCH based measure of volatility. This study adopts the GARCH approach of modelling volatility. Among the various GARCH models in the literature, this study adopts GARCH (1, 1) model due to its parsimony and ability to capture volatility in most time series. The mean equation of the GARCH (1, 1) model is specified as follows:

$$RER_t = \alpha_0 + \alpha_1 RES_t + \alpha_2 IMP_t + \varepsilon_t \quad (4)$$

Where *RES* is defined as international reserves and *IMP* represents imports. Generally, the nominal exchange rate is explained by the reserve position of a country. Also, in developing countries, increases in imports usually put direct pressure on the nominal exchange rate. Changes in the nominal exchange rate affects the real exchange rate, hence, the mean equation is specified to reflect the key determinants of the real exchange rate.

The variance equation of the GARCH (1, 1) is specified as

$$VOL_t = \sigma_t^2 = \varpi + \alpha\varepsilon_{t-1}^2 + \beta\sigma_{t-1}^2 \quad (5)$$

Where σ_t^2 is the one-period ahead forecast variance (time variant conditional variance of the real effective exchange rate) based on past information. It represents volatility of the real effective exchange rate; $\omega \equiv$ constant term; $\varepsilon_{t-1}^2 \equiv$ news about volatility from the previous period, measured as the lag of the squared residual from the mean equation (ARCH term) in equation 4; and $\sigma_{t-1}^2 \equiv$ last period's forecast variance

(GARCH term), α and β are the parameters estimated.

Equation 5 is the regression equation of our interest and gives the conditional variance, which is a function of three terms – the mean (constant); news about the volatility from the previous period measured as a lag of the squared residual from Equation 5, ε_{t-1}^2, also known as the ARCH term; and the last period's forecast variance, σ_{t-1}^2, the GARCH term.

4.3 Estimation Techniques

The study begins the empirical analysis by first examining the time series properties of the variables in logarithmic forms using Augmented Dickey-Fuller (ADF) unit root test and Kwiatkowski-Phillips-Schmidt-Shin (KPSS) stationarity test. The ADF tests the null hypothesis that there is a unit root and a rejection of the null implies the series is stationary. The KPSS, on the other hand, tests the null that there is stationarity where a rejection implies the series is not stationary. The KPSS has been developed to complement the ADF unit root test which has been found to have weak power in rejecting the null. Where the two tests produce conflicting results, it is taken that the series is not stationary and further processing is undertaken.

For non-stationary series, the study conducts cointegration test on the I(1) variables to see if their linear combination is stationary before combining them with stationary series to determine cointegration of the variables in the model. The study adopts a single equation residual-based cointegration approach using Dynamic OLS (DOLS) estimation technique which has been noted to have been producing more efficient estimates than the Static OLS (SOLS) estimation technique. Where cointegration exists, Engle-Granger Representation theorem is invoked for the specification of the error-correction model. In the absence of cointegration, the study estimates a long-run model or a short-run model depending on the stationarity status of the model variables.

4.4 Data Type and Sources

The study makes use of secondary quarterly series for the period 1990Q1 to 2010Q4 obtained from International Financial Statistics and Direction of Trade Statistics of the IMF. However the reference period in the case of Liberia was 2002Q1 to 2010Q4, due to the unavailability of data. The quarterly GDP data were obtained through interpolation of annual time series data using Eviews 7.0. This was done using the low frequency to high frequency method and the quadratic match sum for each observation of the low frequency series. Data were obtained on export, domestic GDP, foreign income, terms of trade and real effective exchange rate. Equation 6 gives a measure of the real effective exchange rate:

$$RER_t = \sum_{i=1}^{n}\left[w_{it}\left(\frac{e_{it} * p_{it}}{P_{dt}} \right)\right] \qquad (6)$$

where RER_t is real effective exchange rate, W_{it} is the i^{th} trading partner trade weight, e_{it} is the bilateral nominal exchange rate (period average) defined as amount of local currency per unit of foreign currency for country *i*, and the prices for non-tradeable and tradeable goods measured by domestic consumer price index (P_{dt}) and trading partner's consumer price index (P_{it}), respectively.

5.0 PRESENTATION AND ANALYSIS OF RESULTS

5.1 Estimation Results for The Gambia

5.1.1 Unit Root Test Results

Table 5.1: Unit Root Test Results for the Gambia

VARIABLE	ADF TEST Null: not stationary	KPSS Null: Stationary	REMARK ON ORDER OF INTEGRATION
LOG(GAMEXP)	-2.273161 (*-2.586103*)	0.608380** (*0.463000*)	I(1)
D(LOG(GAMEXP))	-11.42354*** (*-2.586103*)	0.1606632 (*0.463000*)	
LOG(GAMRER)	-1.995907 (*-3.159372*)	0.140177 (*0.146000*)	I(1)
D(LOG(GAMRER)	-6.037608*** (*-3.159372*)	0.108206 (*0.146000*)	
LOG(GAMTOT)	-2.437374 (*-2.586351*)	1.003004***(*0.463000*)	I(1)
D(LOG(GAMTOT)	-10.02231*** (*-2.586351*)	0.195518 (*0.463000*)	
LOG(GAMVOL)	-4.116470*** (*-2.585626*)	0.231075 (*0.463000*)	I(0)
LOG(GDPOECD)	-3.733144** (*-2.585861*)	0.197146** (*0.146000*)	I(1)
D(LOG(GDPOECD)	-3.175628** (*-2.585861*)	0.133485 (*0.463000*)	

*Source: Computed by the Authors *** 1% significance, ** 5% significance, * 5% significance. Figures in parentheses are 5% critical values for the respective tests.*

From Table 5.1, all the variables are integrated of order one (I(1)) except volatility (GAMVOL) which is integrated of order zero (I(0)). For GAMEXP at log level, both ADF and KPSS tests were consistent in accepting and rejecting the null hypotheses, respectively. The log difference of GAMEXP was found to be stationary by both tests, hence log of GAMEXP is an I(1) variable. For GAMRER at log level, the ADF says it has a unit root, while the KPSS suggests it is stationary. With these conflicting results, the study went on to find the stationarity status of the log difference of GAMRER, which was confirmed by both tests. This implies that GAMRER at log level was integrated of order one. Both the ADF and KPSS were consistent in rejecting the stationarity of GAMTOT at log level but accepting it at log difference. Thus, log of GAMTOT was integrated of order one. GAMVOL at log level was found to be stationary by both tests. For GDPOECD, the ADF results contradicted that of the KPSS in that while the ADF rejected the null of non stationarity, the KPSS also rejected the null of stationarity. Examining the log difference of GDPOECD, both tests were in agreement on its stationarity. This implies the log of GDPOECD is integrated of order one. Non-stationarity of only some of the model variables necessitated carrying out cointegration test at two stages. The results of these tests are reported in the next section.

5.1.2 Cointegration Test Results

At the first stage, cointegration test was conducted only on the I(1) variables. Table 5.2 indicates that the null of no cointegration among the model variables was rejected at 5 percent significance level. Both Engle-Granger tau and z-tests of DOLS confirmed the presence of cointegration. Given that the four non-stationary variables are cointegrated, the study proceeded to the second stage of the cointegation process where all the model variables were tested jointly. The results of this second stage are reported in Table 5.3.

Table 5.2: Engle-Granger Dynamic OLS Cointegration Test Results for the I(1) Variables Only

STATISTIC	VALUE CALCULATED	PROBABILITY VALUE
Engle-Granger tau-statistic	-4.453718	0.0295
Engle-Granger z-statistic	-32.59284	0.0225
Null hypothesis: There is no cointegration (rejected at 5 percent)		

Source: Computed by the Authors

Table 5.3: Engle-Granger Dynamic OLS Cointegration Test on both I(1) and I(0) Variables

STATISTIC	VALUE CALCULATED	PROBABILITY VALUE
Engle-Granger tau-statistic	-5.509163	0.0045
Engle-Granger z-statistic	-44.76453	0.0036
Null hypothesis: There is no cointegration (rejected at 1 percent)		

Source: Computed by the Authors

Table 5.4: Cointegration Equation for both I(1) and I(0) Variables
Dynamic OLS Estimation: Dependent Variable is LOG (GAMEXP)

Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
LOG(GAMRER)	-0.161671	0.396285	-0.407967	0.6847
LOG(GAMTOT)	1.396767	0.107464	12.99755	0.0000
LOG(GAMVOL)	0.292080	0.077580	3.764871	0.0004
LOG(GDPOECD)	2.814031	1.148462	2.450262	0.0170
C	-30.15592	12.05551	-2.501422	0.0149
R-squared	0.953923		Sum squared resid	3.337475
Adjusted R-squared	0.942404		Long-run variance	0.108728
S.E. of regression	0.228359		Durbin-Watson stat	0.931778

Source: Computed by the Authors

Both Engle-Granger tau- and z-tests show that all the variables in the export model for the Gambia were cointegrated at one percent level of significance. The associated cointegrating relationship (which gives the long run regression estimates) is reported in Table 5.4. The cointegrating vector for GAMEXP, GAMRER, GAMTOT, GAMVOL and GDPOECD is [1, 0, -1.4, -0.3, -2.8]. The results suggest that, in the long run, volatility did have significant positive impact on export performance in the Gambia. The coefficient estimate indicates that a one-percentage increase in real exchange rate volatility causes exports to increase by 0.3 percent. This corroborates the positive relationship observed in Figure 1 between volatility and exports. Overall,

Gambian's exports, though primary commodities, were responsive to the real exchange rate volatility induced mainly by the rapid depreciation of the dalasi.

Real effective exchange rate did not have any explanation for variations in the Gambia's exports during the study period. The negative coefficient of the real exchange rate captures more of the real exchange rate appreciation that occurred during the period. The appreciation did not hurt exports largely because Gambian exports are mainly groundnuts whose price is given in the international market. Terms of trade had a significant positive impact on the Gambia's export performance, implying favourable terms of trade encouraged exports in the Gambia, and vice versa. A one-percentage increase in the terms of trade (improvement) induces a 1.4-percentage-point increase in exports-GDP ratio. Similarly, a percentage increase in the income of the rest of the world induces a 2.8-percentage-point increase in Gambia's exports. This result confirms the a priori expectation of the study. Overall, income of the rest of the world and the terms of trade were the key variables that had more-than-proportionate long-run impacts on export performance in the Gambia during the long run.

5.1.3 Short-Run Dynamic Model Results

Having established cointegration among the model variables, the study proceeded to estimate an error-correction model of exports for the Gambia. The parsimonious error-correction model results are reported in Table 5.5. The diagnostic tests of serial correlation, heteroscedasticity and linear misspecification indicate non violation of the assumptions underlying the OLS estimation technique. The significant coefficient estimates show that changes in the terms of trade and volatility were the key factors driving exports in the short run. The coefficient of the error-correction term is statistically significant and correctly signed. The magnitude of the coefficient indicates that about 41.0 percent of any previous disequilibrium in the long-run export relationship is corrected in the current quarter.

Table 5.5: Parsimonious Error-Correction Model Results
Dependent Variable is D(LOG(GAMEXP))

Variable	**Coefficient**	**Std. Error**		**t-Statistic**	**Prob.**
C	0.005950	0.022007		0.270370	0.7876
D(LOG(GAMTOT))	0.976695	0.039900		24.47860	0.0000
D(LOG(VOL2(-2)))	0.098893	0.029246		3.381487	0.0011
ECT	-0.407334	0.108193		-3.764874	0.0003
R-squared	0.893005	B-G LM test	0.385252 (0.6816)	F-statistic	214.2206
Adjusted R-squared	0.888837	ARCH Test	0.526341 (0.4703)	Prob(F-statistic)	0.000000
S.E. of regression	0.197656	RESET Test	0.560555 (0.4563)	Durbin-Watson stat	1.907009

Source: Computed by the Authors

5.2 Estimation Results for Ghana

5.2.1 Unit Root Test Results

Table 5.6: Unit Root Test Results for Ghana

VARIABLE	ADF TEST Null: not stationary	KPSS Null: Stationary	REMARK ON ORDER OF INTEGRATION
LOG(GHAEXP)	-2.683038 (*-2.896779*)	0.295016 (*0.463000*)	I(1)
D(LOG(GHAEXP))	-10.05487*** (*-2.896779*)	0.129680 (*0.463000*)	
LOG(GHARER)	-2.349147 (*-2.585861*)	0.805478***(*0.463000*)	I(1)
D(LOG(GHARER))	-5.679596*** (*-2.585861*)	0.108206 (*0.463000*)	
LOG(GHATOT)	-3.688133** (*-3.161982*)	0.083326 (*0.146000*)	I(0)
LOG(GHAVOL)	-4.583605*** (*-3.158974*)	0.069334 (*0.146000*)	I(0)
LOG(GDPOECD)	-3.733144** (*-2.585861*)	0.197146** (*0.146000*)	I(1)
D(LOG(GDPOECD))	-3.175628** (*-2.585861*)	0.133485 (*0.463000*)	

*Source: Computed by the Authors *** 1% significance, ** 5% significance, * 10% significance. Figures in parentheses are 10% critical values for the respective tests.*

Table 5.6 shows that three of the variables are integrated of order one (I(1)), while the other two are integrated of zero (I(0)). The ADF and KPSS tests were inconsistent on the stationarity status of GHAEXP. While the ADF statistics indicate non-rejection of the null unit root hypothesis, the KPSS fails to reject the null stationary hypothesis. The log difference of GHAEXP was found to be stationary by both tests, hence, log of GHAEXP is an I(1) variable. GHARER at log level has a unit root according to both the ADF and KPSS tests. The log difference of GHARER is stationary according both tests, implying that log level of GHARER is I(1). Terms of trade and volatility variables are integrated of order zero according to both tests. The unit root test results suggest that cointegration test is carried out in two stages: first on the I(1) variables alone and secondly on all the model variables provided cointegration holds in the first stage.

5.2.2 Cointegration Test Results

The first stage cointegration test was carried out on the log levels of GHAEXP, GHARER and GDPOECD which are integrated of order one using dynamic OLS cointegration technique. The results are presented in Table 5.7.

Table 5.7: Engle-Granger Dynamic OLS Cointegration Test on I(1) Variables

STATISTIC	VALUE CALCULATED	PROBABILITY VALUE
Engle-Granger tau-statistic	-2.859286	0.3171
Engle-Granger z-statistic	-17.21210	0.1996
Null hypothesis: There is no cointegration (not rejected at the 5 percent significance level)		

Source: Computed by the Authors

The Engle-Granger tau- and z-tests produced statistics that are smaller than their critical values, thus, giving rise to high probability values. This means that the null hypothesis of no cointegration cannot be rejected at the 5-percent level of significance. Once the I(1) variables are not cointegrated, the study could not proceed to the second phase of the cointegration test. To avoid spurious regression, a short-run export model was estimated for Ghana.

5.5.3 Short-Run Model

It must be noted that estimating a short-run export model with the variables in log forms means estimating export growth performance for Ghana. The parsimonious short-run model results are reported in Table 5.8. The model passed all the diagnostic tests of serial correlation, heteroscedasticity and misspecification. The test result for significance of the complete regression as captured by the F-statistic shows that the model variables significantly jointly explain variations in export growth, although the explanatory power of the model is small (14.0 percent).

From Table 5.8, the impact of real exchange rate volatility on export growth in Ghana is not statistically significant at the conventional level. The terms of trade was found to have a significant positive contemporaneous effect on export growth with an indication that a one-percentage increase in the terms of trade would cause exports growth to increase by 0.22 percent. The growth rate in the rest of the world appears not to have any significant impact on export growth in Ghana during the study period. Though the coefficient was positive, it was statistically insignificant. The real exchange rate is found to have a significant dynamic negative impact on export growth.

Table 5.8: Export Growth Model Results for Ghana
Dependent Variable is D(LOG(GHAEXP))

Variable	**Coefficient**	**Std. Error**		**t-Statistic**	**Prob.**
C	0.098253	0.286799		0.342587	0.7329
LOG(GHATOT)	0.222325	0.106184		2.093777	0.0396
LOG(VOL2)	0.024051	0.030855		0.779479	0.4381
D(LOG(GDPOECD))	5.028241	3.748866		1.341270	0.1838
D(LOG(GHARER(-1)))	-0.837108	0.405958		-2.062055	0.0426
R-squared	0.138826	B-G LM test	0.825109 (0.4422)	F-statistic	2.450331
Adjusted R-squared	0.082170	ARCH Test	0.137931 (0.7113)	Prob(F-statistic)	0.041041
S.E. of regression	0.183708	RESET Test	1.153568 (0.2862)	Durbin-Watson stat	2.090802

Source: Computed by the Authors

5.3 Estimation Results for Guinea

5.3.1 Unit Root Test Results

The unit root results for Guinea are reported in Table 5.9. All the model variables are integrated of order one. Both the ADF and the KPSS tests are consistent on the non-stationarity of the variables at log level. The log differences of the variables are stationary according to both tests. This implies that cointegration can be done on all the variables at a time.

Table 5.9: Unit Root Test Results for Guinea

VARIABLE	ADF TEST Null: not stationary	KPSS Null: Stationary	REMARK ON ORDER OF INTEGRATION
LOG(GUIEXP)	-2.873972 (*-3.158974*)	0.217555*** (*0.146000*)	I(1)
D(LOG(GUIEXP))	-11.08966*** (*-3.158974*)	0.032561 (*0.146000*)	
LOG(GUIRER)	-1.262411 (*-2.588902*)	0.980317*** (*0.463000*)	I(1)
D(LOG(GUIRER))	-6.838337*** (*-2.588902*)	0.147401 (*0.463000*)	
LOG(GUITOT)	-1.954886 (*-2.585861*)	0.685300** (*0.463000*)	I(1)
D(LOG(GUITOT))	-13.22110*** (*-2.585861*)	0.051375 (*0.463000*)	
LOG(GUIVOL)	-1.495534 (*-2.588902*)	0.833625*** (*0.463000*)	I(1)
D(LOG(GUIVOL))	-9.122163*** (*-2.588902*)	0.223725 (*0.463000*)	
LOG(GDPOECD)	-3.733144** (*-2.585861*)	0.197146** (*0.463000*)	I(1)
D(LOG(GDPOECD))	-3.175628** (*-2.585861*)	0.133485 (*0.463000*)	

Source: Computed by the Authors *** 1% significance, ** 5% significance, * 10% significance. Figures in parentheses are 10% critical values for the respective tests.

5.3.2 Cointegration Test Results

The cointegration test results on all the model variables using dynamic OLS technique are presented in Table 5.10. Engle-Granger tau- and z-statistics are not statistically significant, suggesting that the null hypothesis of no cointegration cannot be rejected at 5 percent significance level. This implies that there is no long-run relationship among the variables. Hence, the Engle-Granger Representation Theorem cannot be invoked for the specification of an error-correction model. The study, therefore, estimated a short-run model for Guinea.

Table 5.10: Engle-Granger Dynamic OLS Cointegration Test on all Variables

STATISTIC	VALUE CALCULATED	PROBABILITY VALUE
Engle-Granger tau-statistic	-2.650358	0.7628
Engle-Granger z-statistic	-14.36633	0.7040
Null hypothesis: There is no cointegration (not rejected at the 5 percent significance level)		

Source: Computed by the Authors

5.3.3 Short-Run Dynamic Model

The results of the parsimonious short-run export model are presented in Table 5.11. The diagnostic tests (Breusch-Godfrey Serial Correlation LM Test, ARCH Heteroscedasticity Test and Ramsey RESET Test) indicate that the estimated model did not suffer from problems of serial correlation, heteroscedasticity and model misspecification. The F-test shows that the explanatory variables jointly explain variations in export growth at 1 percent significance level. The explanatory power of the model shows that 53 percent of the variation in the dependent variable is accounted for by the independent variables. Although the coefficient of volatility carries a negative sign, it is not statistically significant. This means that volatility did not affect export growth in Guinea over the study period. The growth of income of the rest of the world and real exchange rate depreciation did not significantly impact on export growth during the period. However, the terms of trade had significant positive impact on export growth. The magnitude of its coefficient implies a one-percentage increase in the terms of trade induces 0.67 percent rise in export growth.

Table 5.11: Short-Run (Export Growth) model results for Guinea
Dependent Variable is D(LOG(GUIEXP))

Variable	**Coefficient**	**Std. Error**		**t-Statistic**	**Prob.**
C	0.000275	0.020993		0.013122	0.9896
D(LOG(GDPOECD))	2.448431	2.807699		0.872042	0.3859
D(LOG(GUIRER))	0.341741	0.238463		1.433097	0.1559
D(LOG(GUITOT))	0.678305	0.078253		8.668119	0.0000
D(LOG(VOL2(-2)))	-0.019124	0.018205		-1.050427	0.2969
R-squared	0.526379	B-G LM test	0.316777 (0.7295)	F-statistic	21.11643
Adjusted R-squared	0.501451	ARCH Test	0.108529 (0.7427)	Prob(F-statistic)	0.000000
S.E. of regression	0.134375	RESET Test	0.001170 (0.9728)	Durbin-Watson stat	2.081791

Source: Computed by the Authors

5.4 Estimation Results for Liberia

5.4.1 Unit Root Test Results

Table 5.13 reports the ADF and KPSS stationarity test results. Apart from GDPOECD, all the variables in the model are integrated of order zero. For Liberia, the variables have only 36 quarterly observations due to missing data during the war period. The number of observations is not sufficient to carry out KPSS test since it goes with asymptotic critical values, hence, stationarity status of the variables are determined solely by the ADF test statistics. Accordingly, all the variables are found to be stationary except GPDOECD.

Table 5.12: Unit Root Test/ Stationarity Test Results for Liberia

VARIABLE	ADF TEST Null: not stationary	KPSS Null: Stationary	REMARK ON ORDER OF INTEGRATION
LOG(LIBEXP)	-5.544743*** (*-3.204699*)	0.143792 (*0.146000*)	I(0)
LOG(LIBRER)	-2.139776*** (*-1.609798*)	0.728819** (*0.463000*)	I(0)
LOG(LIBTOT)	-5.543640*** (*-3.204699*)	0.171756** (*0.146000*)	I(0)
LOG(LIBVOL)	-2.888219*** (*-1.610747*)	0.674004** (*0.463000*)	I(0)
LOG(GDPOECD)	-3.733144** (*-2.585861*)	0.197146** (*0.146000*)	I(1)
D(LOG(GDPOECD))	-3.175628** (*-2.585861*)	0.133485 (*0.463000*)	

Source: Computed by the Authors *** 1% significance, ** 5% significance, * 10% significance. Figures in parentheses are 5% critical values for the respective tests.

5.4.2 Dynamic Long-Run Model

Given the foregoing unit root test results, GDPOECD is the only I(1) variable and, therefore, cannot combine with any other I(1) variable in the cointegration process. The study first attempted including its first log difference in the regression model but the result was not encouraging. Thus, for Liberia, the study estimated a long-run export model excluding GDPOECD. The parsimonious dynamic long-run model results are presented in Table 5.13.

The model did not suffer from problems of serial correlation, heteroscedasticity and model misspecification as the three key diagnostic tests returned insignificant F-statistics. Statistically, all the variables in the parsimonious model jointly explain variations in exports for Liberia during the study period as the F-statistic of testing the significance of the complete regression is significant at 1 percent. Overall, the model explains 97 percent of the total variations in exports.

The results showed that volatility and terms of trade are found to have significant effects on exports, while the coefficient of the real effective exchange rate was found to be insignificant. A one-percentage increase in volatility induces 0.19 percentage decrease in exports. The terms of trade have both significant positive contemporaneous effect and negative dynamic effect on exports. The net impact of the terms of trade on Liberia's exports was positive, indicating that a percentage increase in the terms of trade induces 0.61 percentage increase in exports. Also, there was significant export inertia as the two previous quarters' exports have explanation for the current level of exports. Here, a percentage increase in

previous exports value will cause the current level of exports to rise by 0.32 percent.

Table 5.13: Long-Run Export Model Results for Liberia
Dependent Variable is LOG(LIBEXP)

Variable	**Coefficient**	**Std. Error**		**t-Statistic**	**Prob.**
C	-2.483966	1.127551		-2.202975	0.0363
LOG(LIBEXP(-1))	0.401261	0.188384		2.130023	0.0424
LOG(LIBEXP(-2))	-0.078684	0.040861		-1.925656	0.0647
LOG(LIBTOT)	0.987738	0.041059		24.05640	0.0000
LOG(LIBTOT(-1))	-0.378379	0.181635		-2.083186	0.0468
LOG(LIBVOL(-1))	-0.188325	0.073740		-2.553906	0.0166
LOG(LIBRER(-2))	0.379796	0.331804		1.144641	0.2624
R-squared	0.965850	B-G LM test	2.332151 (0.1178)	F-statistic	127.2702
Adjusted R-squared	0.958261	ARCH Test	1.127626 (0.2965)	Prob(F-statistic)	0.000000
S.E. of regression	0.133712	RESET Test	0.178692 (0.6760)	Durbin-Watson stat	2.184667

Source: Computed by the Authors

5.5 Estimation Results for Nigeria

5.5.1 Unit Root Test Results

The stationarity test results are reported in Table 5.14 which shows that NIGEXP, NIGTOT and NIGVOL are integrated of order zero; whilst NIGEGDP and GDPOECD are integrated of order one. Apart from GDPOECD, both the ADF and KPSS tests were consistent on the stationarity of the variables.

Table 5.14: Unit Root Test Results for Nigeria

VARIABLE	ADF TEST Null: not stationary	KPSS Null: Stationary	REMARK ON ORDER OF INTEGRATION
LOG(NIGEXP)	-4.332414*** (*-2.897223*)	0.141249 (*0.463000*)	I(0)
LOG(NIGRER)	-1.819486 (*-2.896779*)	0.270662 (*0.463000*)	
D(LOG(NIGRER))	-7.632208*** (*-2.896779*)	0.049419 (*0.463000*)	I(1)
LOG(NIGTOT)	-3.467957** (*-2.897223*)	0.180623 (*0.463000*)	I(0)
LOG(NIGVOL)	-5.767781*** (*-2.896779*)	0.400430 (*0.463000*)	I(0)
LOG(GDPOECD)	-3.733144** (*-2.585861*)	0.197146** (*0.146000*)	
D(LOG(GDPOECD))	-3.175628** (*-2.585861*)	0.133485 (*0.463000*)	I(1)

Source: Computed by the Authors *** 1% significance, ** 5% significance, * 10% significance. Figures in parentheses are 5% critical values for the respective tests.

5.5.2 Cointegration Test Results

Given the I(1) variables, cointegration test was carried out on them first before they were combined with the I(0) variables. The dynamic OLS cointegration test shows that NIGRER and GDPOECD are not cointegrated as the Engle-Granger tau- and z-statistics are not significant at the 5 percent level. Thus, the second phase of the cointegration process was truncated; implying error-correction model could not be formulated.

Table 5.15: Engle-Granger Dynamic OLS Cointegration Test on I(1) Variables

STATISTIC	VALUE CALCULATED	PROBABILITY VALUE
Engle-Granger tau-statistic	-2.042030	0.5095
Engle-Granger z-statistic	-8.037317	0.4758
Null hypothesis: There is no cointegration (not rejected at the 5 percent significance level)		

Source: Computed by the Authors

5.5.3 Long-Run Model

The study estimated a dynamic long-run model with log difference of NIGRER as depreciation/appreciation and log difference of GDPOECD as the income growth in the rest of the world. The results of the parsimonious dynamic model are reported in Table 5.16. Breusch-Godfrey Serial Correlation LM Test shows that the error terms are not serial correlation but the ARCH Heteroscedasticity Test indicates a presence of heteroscedasticity. The study therefore proceeded to run White Heteroskedasticity robust model whose results are reported in Table 5.17.

Comparing the two tables (5.16 and 5.17), it is clear that the robust estimation improved the efficiency of the estimator as growth in the rest of

the world income which was significant at 10 percent in the initial model became insignificant in the robust model, while volatility and real exchange rate lagged 2 which were not initially significant became significant. Hence, the discussion will focus on the results in Table 5.17. According to the F-test on the complete regression, the variables in the robust parsimonious model jointly explain variations in exports with an explanatory power of 80 percent.

The magnitude of the coefficient of volatility shows that a percentage increase in volatility induces 0.04 percent decrease in exports. This significant negative impact of volatility reflects risk-averse nature of Nigerian exporters. Real exchange rate depreciation had negative dynamic impact on exports with a percentage increase in real appreciation causing exports to decline by 0.23 percent. The terms of trade had a positive contemporaneous but a negative dynamic effects on exports. The net impact of the terms of trade on exports was positive with a percentage increase in the terms of trade causing exports to increase by 0.09 percent. A percentage rise in the past level of exports increases the current level of exports by 0.75 percentage points, implying export performance inertia in Nigeria.

Table 5.16: Dynamic Long-Run Model Results for Nigeria
Dependent Variable is LOG(NIGEGDP)

Variable	**Coefficient**	**Std. Error**		**t-Statistic**	**Prob.**
C	-0.802580	0.407502		-1.969512	0.0527
LOG(NIGEXP(-1))	0.746139	0.101186		7.373916	0.0000
D(LOG(GDPOECD))	5.490079	4.049605		1.355707	0.1794
LOG(NIGTOT)	0.526474	0.086978		6.052962	0.0000
LOG(NIGTOT(-1))	-0.325805	0.135560		-2.403392	0.0188
LOG(NIGTOT(-2))	-0.112378	0.061584		-1.824779	0.0722
LOG(VOL2(-1))	-0.036271	0.018787		-1.930599	0.0575
D(LOG(NIGRER)) (-2)	-0.227625	0.090258		-2.521933	0.0139
R-squared	0.802562	B-G LM test	-	F-statistic	36.58389
Adjusted R-squared	0.780624	ARCH Test	-	Prob(F-statistic)	0.000000
S.E. of regression	0.095297	RESET Test	-	Durbin-Watson stat	1.908514

Source: Computed by the Authors

5.6 Estimation Results for Sierra Leone

5.6.1 Unit Root Test Results

The results presented in Table 5.18 indicate that SIEEXP, SIERER and GDPOECD at log levels are integrated of order one, whilst SIETOT and SIEVOL at log levels are integrated of order zero. Both the ADF and KPSS test are consistent on the stationarity status of SIEEGDP, SIETOT and SIEVOL. The KPSS suggests that SIERER may be integrated of order two since it rejects the stationarity of the first log difference of SIERER at 5 percent level. However, the strength of the ADF statistic shows that SIERER should be taken as an I(1) variable.

Table 5.18: Unit Root Test Results for Sierra Leone

VARIABLE	ADF TEST Null: not stationary	KPSS Null: Stationary	REMARK ON ORDER OF INTEGRATION
LOG(SIEEXP)	-2.548074 (*-2.896779*)	0.233941*** (*0.463000*)	I(1)
D(LOG(SIEEXP))	-8.670562*** (*-2.896779*)	0.066738 (*0.463000*)	
LOG(SIERER)	-2.891621 (*-3.464865*)	0.216325*** (*0.146000*)	I(1)
D(LOG(SIERER))	-10.12544*** (*-3.464865*)	0.162213** (*0.146000*)	
LOG(SIETOT)	-2.933631** (*-2.896779*)	0.238824 (*0.463000*)	I(0)
LOG(SIEVOL)	-5.563861*** (*-2.896779*)	0.191582 (*0.463000*)	I(0)
LOG(GDPOECD)	-3.733144** (*-2.585861*)	0.197146** (*0.146000*)	I(1)
D(LOG(GDPOECD))	-3.175628** (*-2.585861*)	0.133485 (*0.463000*)	

*Source: Computed by the Authors *** 1% significance, ** 5% significance, * 10% significance. Figures in parentheses are 10% critical values for the respective tests.*

5.6.2 Cointegration Test Results

The first phase of the cointegration process focused on testing for cointegration among the three I(1) variables. The results are reported in Table 5.19. Engle-Granger tau- and z-statistics are significant at 10% level, hence, the rejection of the null hypothesis that there is no cointegration. The study proceeded with the second phase of the cointegration process by testing for cointegration among all the model variables. The results of this second test are presented in Table 5.20.

Table 5.19 Engle-Granger Dynamic OLS Cointegration Test on I(1) Variables

STATISTIC	VALUE CALCULATED	PROBABILITY VALUE
Engle-Granger tau-statistic	-3.595634	0.0868
Engle-Granger z-statistic	-21.80733	0.0834
Null hypothesis: There is no cointegration (rejected at 10 percent significance level)		

Source: Computed by the Authors

Table 5.20: Engle-Granger Dynamic OLS Cointegration Test on both I(1) and I(0) Variables

STATISTIC	VALUE CALCULATED	PROBABILITY VALUE
Engle-Granger tau-statistic	-4.637704	0.0445
Engle-Granger z-statistic	-35.52098	0.0307
Null hypothesis: There is no cointegration (rejected at 5 percent significance level)		

Source: Computed by the Authors

The Engle-Granger tau- and z-tests revealed the presence of cointegration among all the model variables at 5% level of significance. The cointegration relationship among the variables is reported in Table 5.21. The related cointegrating vector is [1, -1.6, -1.1, -1.1, 0, 0] for variable combination SIEEXP, GDPOECD, SIERER, SIETOT, SIEVOL and DUMMY. Thus, in the long run, volatility though negative, does not affect export performance. As in many other cases, the non-significance of volatility impact could be explained by the nature of the country's export, which are mostly primary commodities.

Table 5.21: Cointegration Relationship among the I(1) and I(0) Variables

Dynamic OLS Estimation: Dependent Variable is LOG(SIEEXP)

Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
LOG(GDPOECD)	1.584142	0.624446	2.536876	0.0138
LOG(SIERER)	1.079503	0.504418	2.140096	0.0364
LOG(SIETOT)	1.147853	0.074911	15.32287	0.0000
LOG(VOL2)	-0.040485	0.182072	-0.222356	0.8248
DUMMY	-0.239165	0.178828	-1.337400	0.1861
C	-24.86272	7.042972	-3.530146	0.0008
R-squared	0.957691		Sum squared resid	3.321404
Adjusted R-squared	0.943588		Long-run variance	0.118525
S.E. of regression	0.235280		Durbin-Watson stat	0.990083

Source: Computed by the Authors

The income in the rest of the world, real effective exchange rate and terms of trade all had significant positive long-run impacts on export performance in Sierra Leone, which are consistent with the stated a priori expectations. A percentage increase in the income of the rest of the world induces a 2.1 percentage increase in exports from Sierra Leone. A one-percentage point increases in real effective exchange rate and terms of trade cause exports to increase by 1.1 and 1.1 percent, respectively. Dummy capturing the civil war period in Sierra Leone has a negative but insignificant coefficient, implying the civil war tended to have a dampening effect on export performance in Sierra Leone but the impact has not been borne out by the data.

5.6.3 Short-Run Dynamic Model

The presence of cointegration calls for estimation of the error-correction model whose results are reported in Table 5.22. The diagnostic test results show that the parsimonious error-correction model did not suffer the problems of serial correlation, heteroscedaticity, and linear misspecification. All the explanatory variables jointly explain variations in export growth as indicated by the significant F-statistic at 1%. The explanatory power of the model is 90 percent. Overall, the estimated coefficients are worthy of discussion.

Volatility had a dynamic negative impact on export growth with a percentage increase inducing 0.19 percentage point decrease in export growth, while income growth in the rest of world had a positive impact on export growth over the study period. The terms of trade had both a contemporaneous and a dynamic effect on export growth, but the overall impact was found to be positive, indicating that a one percentage point increase in terms of trade would improve export performance by 0.78 percent. In addition, real effective exchange rate was found to have a negative impact on export performance during the review period. There was export inertia as captured by significant effect of past export growth on current level. The magnitude of the coefficient estimate of the error-correction term shows that 37.0 percent of any previous disequilibrium in the long-run export relationship will be corrected in the current period.

Table 2.22: Error-Correction Model Results for Sierra Leone

Dependent Variable is D(LOG(SIEEXP))

Variable	**Coefficient**	**Std. Error**		**t-Statistic**	**Prob.**
C	-0.030582	0.027842		-1.098381	0.2756
D(LOG(SIEEXP(-2)))	0.183439	0.095339		1.924075	0.0582
D(LOG(GDPOECD))	6.603415	3.674514		1.797085	0.0765
D(LOG(SIERER))	-0.643909	0.238760		-2.696892	0.0087
D(LOG(SIETOT))	0.917087	0.043338		21.16151	0.0000
D(LOG(VOL2(-2)))	-0.185458	0.053515		-3.465548	0.0009
D(LOG(SIETOT(-2)))	-0.133498	0.094925		-1.406353	0.1639
ECT(-1)	-0.373941	0.093543		-3.997542	0.0002
R-squared	0.898224	B-G LM test	0.029869 (0.9706)	F-statistic	92.03721
Adjusted R-squared	0.888465	ARCH Test	0.005151 (0.9430)	Prob(F-statistic)	0.000000
S.E. of regression	0.179862	RESET Test	1.708664 (0.1953)	Durbin-Watson stat	1.997669

Source: Computed by the Authors

6.0 CONCLUSION AND POLICY RECOMMENDATIONS

Conclusion

This study investigated the effect of real exchange rate volatility on exports performance in the WAMZ countries within a single equation residual-based cointegration approach using Dynamic OLS (DOLS) estimation technique, using quarterly data for the period 1990Q1 to 2010Q4. The study also employed the GARCH (1, 1) approach to measure the volatility of the real effective exchange rate. The results of the cointegratioon analysis revealed the existence of cointegration in the case of The Gambia and Sierra Leone, while no cointegration was established for Ghana, Guinea and Nigeria. The variables in the case of Liberia were found to be integrated of order zero, i.e. I(0) series, so no cointegration test was applied.

The empirical findings indicate that real effective exchange rate volatility had significant negative impact on export performance in Liberia, Nigeria and Sierra Leone (both in the long run and short run), while a positive long- and short-run impact was establish in the case of The Gambia. However, its impact on Ghana and Guinea was found to be insignificant. The results are consistent with the three strands in the literature: volatility-harming-exports hypothesis as found in Grobar (1993), Gonzanga and Terra (1997), Sekkat and Vardoulakis (1998), Ogun (1998), Adubi and Akumadewa (1999), Sorsa (1999) and Darrat and Hakin (2000); volatility-promoting-export hypothesis as contained in studies like Franke (1991), and Secru and Vanhall (1992); as well as volatility-not-affecting-exports hypothesis as articulated in Kohlhagen (1978), Bailey and Tavlas (1988), and Holly (1995).

The results also revealed a positive relationship between terms of trade and export performance for all the countries, indicating that improvement in terms of trade triggered increases in export performance in the WAMZ countries. Furthermore, income from the rest of the world impacted positively on export performance in the WAMZ countries, although it was found to be insignificant in the case of Ghana, Guinea and Nigeria. The study also found that real effective exchange rate had negative impact on export performance in the case of The Gambia, Ghana and Nigeria, while a positive relationship was established in the case of Guinea and Liberia. However, while a positive relationship was revealed in the long run in the case of Sierra Leone, its impact in the short run was negative.

Policy Recommendations

Given that a negative relationship was established between real effective exchange rate volatility and export performance in the case of Liberia, Nigeria and Sierra Leone, export performance can be improved if governments in these countries undertake policies aimed at maintaining a stable real effective exchange rate. This can be achieved by pursuing policies aimed at controlling inflationary pressures as well as maintaining stability of their domestic currencies vis-à-vis foreign currencies. Also, in order to ease the impact of real effective exchange volatility, the authorities in Liberia, Nigeria and Sierra Leone are encouraged to implement policies aimed at diversifying the pattern of their exports, which would improve economic fundamentals and help bring about sustained growth in export earnings. The countries are also encouraged to continue implementing viable fiscal and monetary policies as well as structural reforms that would contribute to decline in per unit cost of production and the improvement in international competitiveness of exporters.

The Authorities of the WAMZ countries are urged to initiate policies to boost local production to satisfy local consumption, in a view to reduce demand pressure on their respective exchange rates. This will help stabilize their exchange rates while increasing production capacity, boosting stock of export goods, growth and income.

Another lesson from the findings is that trade policy actions aimed at stabilizing the export market are likely to generate uncertain results at best, if policymakers in the WAMZ countries

ignore the stability as well as the level of the real exchange rate. Thus, if policymakers wish to target exports, it is likely that policies which will ensure stability of the exchange rate should be most effective.

Given that a positive relationship was established between exchange rate volatility and export performance for The Gambia, however, the authorities are urged to implement measures aimed at stabilizing the exchange rate. Excessive depreciation of the exchange rate may impact negatively on other macroeconomic variables, which in turn may dampen the positive impact on export growth.

Despite the insignificant impact of real effective exchange rate volatility on export performance in Ghana and Guinea, excessive volatility may adversely affect other macroeconomic variables in these economies through other channels. Therefore, a stabilization policy aimed at mitigating excessive exchange rate volatility is an appropriate strategy to promote macroeconomic stability in these countries.

The study also revealed a positive relationship between terms of trade and export performance for the WAMZ countries. The authorities are encouraged to consolidate the gains from increased export prices by improving the quality (processing) and volume of exportables, as well as maintaining stability in both domestic prices and exchange rate.

The WAZM countries are also encouraged to maintain the real exchange rate at its appropriate level that will achieve both internal and external equilibrium. Keeping it at competitive levels and avoiding excessive volatility is crucial for enhancing export performance and economic growth. Thus, monitoring real exchange rate movements would become a useful tool for central banks to ensure macroeconomic stability and growth.

REFERENCES

Arize, C. A. and Osang, T. and Slottje, J. D. (2000), "Exchange rate volatility and foreign trade: evidence from Thirteen LDCs", *Journal of Business and Economic Statistics*, Vol. 18 (1) 10-17.

Asseery, A. and Peel, D. A. (1991), "The effects of exchange rate volatility on exports", *Economics Letters, 37, 173-177*

Bah, I. and Amusa, H. A. (2003), "Real exchange rate volatility and foreign trade: evidence from South Africa's exports to the United States", *The African Finance Journal*, 5, 2: 1-20.

Bini-Smaghi, Lorenzo (1991), "Exchange Rate Variability and Trade: Why Is It So Difficult to Find any Empirical Relationship? *Applied Economics*, 23, May, pp. 927-35.

Brada, J. C. and Méndez, J. A. (1988), "Exchange Rate Risk, Exchange Rate Regime and the Volume of International Trade", *KYKLOS*, 41: 263-80

Caballero, R. J., and Corbo, I. V. (1989), "The Effect of Real Exchange Rate Uncertainty on Exports: Empirical Evidence", *The World Bank Economic Review*, 3, pp. 263-78.

Chowdhury, A. R. (1993), "Does exchange rate volatility depress trade flows? Evidence from error correction models", *Review of Economics and Statistics*, 76, 700-06.

Clark, P. B. (1973), "Uncertainty, Exchange Risk, and the Level of International Trade", *Western Economic Journal*, 11 (September): 302-13.

Cote, A. (1994), "Exchange rate volatility and trade: A survey", *Working Paper* 94-5, Bank of Canada.

Cushman, D. O. (1986), "Has exchange risk depressed international trade? The impact of third-country exchange risk", *Journal of International Money and Finance, 5, 361-379*

Cushman, D. O. (1988), "U.S. bilateral trade flows and exchange risk during the floating period", *Journal of International Economics, 25, 317-330*

de Grauwe, P. (1983), "Symptoms of an Overvalued Currency: the Case of the Belgium Franc", in *International Economic Adjustment: Small Countries System*, DE

Fountas, S. and Aristotelous, K. (1999a), "Has the European Monetary System led to more exports?: Evidence from bilateral exports in the European Monetary System", *Economics Letters*, 62(3, March): 357–63.

Fountas, S. and Aristotelous, K. (1999b). "The impact of the exchange rate regime on exports: Evidence from the European Monetary System", *Working Paper No. 38*, National University of Ireland, June

Franke, G. (1991), "Exchange rate volatility and international trading strategy", *Journal of International Money and Finance*, 10 (2), 292–307

Hassan, M. K. and Tufte, D. R. (1998), "Exchange rate volatility and aggregate export growth in Bangladesh", *Applied Economics*, 30(2): 189–201

Hooper, P. & Kohlhagen, S. W. (1978), "The effect of exchange rate uncertainty on the prices and volume of international trade", *Journal of International Economics, 8, 483-511*

IMF (1984), "Exchange Rate Volatility and World Trade", *Occasional Paper No. 28*, July, International Monetary Fund, Washington, D.C

Marston, R. C. (1988), "Exchange Rate Policy Reconsidered", *Economic Impact*, no. 6

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

Sercu, P. and Vanhulle, C. (1992), "Exchange rate volatility, international trade, and the value of exporting firm", *Journal of Banking and Finance*, 16 (1), 152–182

Vergil, H., (2002), "Exchange Rate Volatility in Turkey and Its Effect on Trade Flows", Journal of Economic and Social Research, 4 (1), 83-99.