

Exchange Rate Volatility and Trade Flows in The Euro Area

Lawrence MAISHU NGALIM¹

Zelha ALTINKAYA²

Firat BAYIR³

Abstract

This paper examines the euro area as an optimum currency area alongside the current financial crisis. In evaluating the effectiveness of the Eurozone's currency club, this research measured the effects of 2008 financial crisis in the Eurozone by considering exchange rate volatility on trade flows between the United States and the Eurozone. The study employed a conditional autoregressive distributed lag model or bound testing as its empirical methodology, which verifies co-integration between variables and further differentiates the short and long run impacts. The selection of the appropriate model or the lag length is based on Schwarz Information Criterion and Akaike Information Criterion. The data is a quarterly time series data from 1999 to 2014, which provides enough observations for the time-series econometric model. The empirical findings revealed exports were more sensitive than imports to exchange rate volatility. The short run causality effects were generally minimal and the speed of recovery back to the macroeconomic equilibrium was higher in exports than imports. In definitive, the euro area is not a perfect example of a currency club as pointed out by the transfer of asymmetric shocks to members. However, this study recommends that future studies on exchange rate risk vis-à-vis trade be broken down at the level of trade flows into various economic activities or sectors. Testing for imports and exports as a whole, seems too vast to better appreciate and interpret results correctly.

Keywords: *Exchange rate, exchange rate volatility, trade flows, euro, ARDL*

¹ M.Sc. Institute of Social Sciences, Department of Business Administration, Istanbul Aydin University, lawrencemaishu@yahoo.com

² (Assistant Professor), Institute of Social Sciences, Department of Business Administration, Istanbul Aydin University

³ (Assistant Professor), Institute of Social Sciences, Department of Business Administration, Istanbul Aydin University

1. Introduction

Central African Economic and Monetary Community (CEMAC), Economic Community of Central African States (ECCAS), Euro Area (E.A), the United States currency area, Canadian currency area are just few example of recent tendency on use of common currency all over the World. Since the Euro area has some special properties like too many countries, language and cultural diversity, significant number of members, we are therefore going to concentrate studies principally on the E.A as optimum currency area.

After the 2008 global financial crisis, devastating consequences spread to Europe. The fiscal problems or financial crisis that resulted from the global crises has affected the present day European Union (E.U.) thereby compromising the future of the Euro area (E.A). Since 2008, the European Central Bank (ECB) has adopted strategies aimed at stabilizing and closing macroeconomic disequilibrium in the euro club. The sovereign debt crisis in euro area has raised doubts about the viability of European Economic and Monetary Union (EMU) and the future of the euro and its monetary system.

By mid 2000s, Federal Reserve increased interest rates on subprime loans by 4% and since the United States household largely depended on mortgage, which is also referred to as subprime loans --- loans granted without much collateral security to households. When these rates increased, ability to repay became difficult, thus the beginning of collapse. These housing bubbles via various securitization channels affected financial markets of major advanced economies. These shocks were directly transmitted to banks because they were heavily involved in real estate, consequently banks started witnessing defaults. The climax of this default was the bankruptcy or collapse of the U.S Lehman Brothers around September 2008. The shocks rapidly spread to Europe and hit the entire euro area but the difficulties were so conspicuous in the economies of Portugal, Ireland, Italy, Greece and Spain because they used advantage of cheap credits to borrow and finance their economies. Consequently, these difficulties translated a significant downturn in the Euro Area.

According to the European Central Bank, by the end of 2008, the Euro area had registered the worst ever growth rate of -2.1%, less than 8% unemployment rates, increased price levels, huge government debts and negative current account balances. The period of 2008/2009 saw a deterioration of balance of payment position, exchange rate volatility or variation between the euro area and its partner, the United States in the last quarter of 2008 and first quarter of 2009, heightened, with a rate of approximately 1.6% with respect to the United States dollars. Exports and imports especially in the last quarter of 2008 and first quarter of 2009 registered a decline. These macroeconomic indicators registered disequilibrium in the euro area in a general but in an asymmetric manner. This asymmetry of shocks pushed researchers to ask questions if truly the euro zone is optimal. This paper is therefore interested to investigate the optimality in the euro area currency zone within a monetary union.

2. Purpose Of The Article

Euro zone being a key player in global economy (especially as there are arguments suggesting Greece might leave the euro area with adverse consequences) will be the area under consideration. Trade flows with the United States and the Euro Area partner will be studied to see how changes in exchange rate affected trade through imports and exports. Studies have demonstrated that the 2008 economic crisis transmitted asymmetric shocks to the various sovereign Euro Area states via various channels. One of the transmission mechanisms was via trade flows. Existing empirical write-ups have largely pointed out a significant relationship between exchange rate and other variables like imports and exports. Very limited has been done when it comes to evaluating the gap existing between exchange rates variations or changes and its measured impacts on trade flows in the euro area.

3. Methodology Of The Study

This research is going to use conditional autoregressive distributed lag (ARDL) or bound test approach to cointegration, which checks cointegration of variables, that is, investigating the relationship amongst variables in the long run based on standard F-test, (Pesaran et al, 2001). At first, two main approaches existed to check cointegration;

- The two-step residuals based procedures for testing the null of no-cointegration, (Engel & Granger, 1987)

- The system-based reduced rank regression approach, (Johansen, 1995)

The two old models of testing for cointegration amongst variables suggested that variables are integrated in the I(1).

Pesaran et al, (2001), adopts a new approach to check relationship amongst variables—they suggest variables could be stationary I(0), integrated of first order I(1) or mutually cointegrated. The advantage of an Autoregressive distributed lag model is that it does not require a pre-unit-root testing of variables. Secondly, it measures the long run and short run effects of exchange rate volatility on trade flows. In conformity to (Bahmani-Oskooee & Mitra, 2008), this methodology explains better the research as exchange rate volatility could be stationary where as other variables are non-stationary. Again, the estimates from the long run model generally indicate unbiased results of the long run t-statistics. The technical part of this work will seek to evaluate the euro area in the recent financial shock; exchange rate volatility or risk between the euro area and the United States and the impacts of this volatility on trade flows.

3.1. Data and Sources

The dependent variables are imports and exports; imports from the United States and exports to the United States from the euro area. The independent variables or explanatory variables are Exchange rate values between the Euro and dollars, the Gross Domestic Product (GDP) was used as a proxy for income since it measures the growth rates, exchange rate Volatility was considered as the standard deviation of exchange rates. Exchange rate data were retrieved from ECB statistical warehouse, GDP rates were retrieved from Organization for Economic Co-operation and Development (OECD) and imports and exports values were retrieved from the United States census Bureau. The period under consideration is 01/01/1999 to 31/12/2014; the data is expressed on quarterly basis with total observations of 64. This large study period permits the estimations of exchange rate changes on trade flows over a long period.

4. Theoretical Background

It's been almost half a century since the classical authors propounded literature on Optimum Currency Area (OCA). The selected review of the

literature is going to answer the research questions and also state major conclusions of the theories. The groundwork will be used to search for characteristics that will be used to define OCA.

The first person to have coined and designed the phrase ‘‘Optimum Currency Area’’ was the Canadian Economist Robert Mundell in 1961 in his seminal paper entitled ‘‘A Theory of Optimum Currency Areas’’ Mundell defined optimum currency area as a geographical unit closely integrated through international trade and factor movements such as labor and capital. The theory stated that fixed exchange rate systems are most appropriate for these areas. Mundell (1961) identified the effects of adopting a currency in an area and advocated the formation of a common and harmonized fiscal authority to ease the transfer of resources amongst members of that OCA facing asymmetric shocks when mechanisms such as wage and price flexibility or labor mobility fail to achieve the desired goals. One of the main failures of the euro zone and that has plunged the area to macroeconomic instability at this point is the inability to create an institution that will discipline fiscal policies within members of the currency region (Alojzy & Yochanan, 2012).

McKinnon (1963) drew inspiration from the drawbacks of Mundell (1961), theory. McKinnon centralized his studies on factor immobility between regions. According to him, each area within the currency area has its own specificity and specialized industries. This makes it difficult to differentiate immobility emanating from geographical perspective with that arising from inter-industrial (McKinnon, 1963). The theories of Mundell (1961), and that of McKinnon (1963), conclude in affirming that factor mobility is a vital parameter in constructing an Optimum Currency Area.

The criterion of factor mobility earlier discussed was expanded via product diversification of Kenen (1969). He suggested that if labor is mobile, and production also diversified, there would be an optimal functioning of the region. The definition of a region should not be based on geographical or political motive but rather on the activities. Kenen (1969) went further to explain that perfect inter-regional labor mobility requires perfect occupational mobility. This is realized when the nature of job (labor) is a similar skilled labor. Furthermore, the analysis of Horvath, (2003) in

the light of Kenen's work, Horvath demonstrates that, a well-diversified economy also has a diversified export sector. Kenen (1969) maintains that product diversification reduces the probabilities of asymmetric shocks and equally reduces their negative effects; hence fixed rates are acceptable to a well-diversified economy.

Corden (1972) sees single currency regions as just an exchange rate region. Adhering to a currency union means total loss of control over monetary and exchange policies. He however concludes that wages and price flexibility should be central in forming a common currency area while considering inflation differentials as costly and dangerous in such an endeavor (Corden, 1972).

Ishiyama (1975) cautions that prospective single currency union members should make a cost-to-benefit analysis before adhering to such a union. Ishiyama (1975), raises some other criteria to be preconditions for joining such as inflation differences, wage packages and even social preferences. Just as indicated earlier by Corden (1972).

This theory went to slumber but however re-surfaced in the 1990s following the birth of a European Monetary Union, Central African Monetary Union just to name a few, when more and more researchers took keen interest again in the theory. As there was significant improvement and development on the international monetary scene, Tavlas (1993), introduced another important factor in the revival of interest in the OCA theory. De Grauwe (1992) termed these theoretical developments the "new" theory of optimum currency areas.

Significant contemporary contribution to OCA vis-à-vis the euro area was the report of European Communities in 1990, which outlined the advantages of a single or one-currency area. That is "One Market, One Money" in which authors raised difficulties likely to erupt from such a union, but did not hesitate to recommend further integration via monetary unification. There are many issues that the new approach of OCA takes keen interest in such as: Monetary Policy effectiveness; Endogeneity of OCA criteria; correlation and variations of shocks; Effectiveness of exchange rate adjustments; synchronization of business cycles and political influences

To some, there are no veritable write-ups on an appropriate and resounding pathway to adopting a common currency. The analysis of Bayoumi and Eichengreen (1992) shows signals of high symmetry of shocks in the heart of the euro area.

Larosière (2012) outlines the current crisis facing the Euro Area as a great differences that arise from the heavy exporting countries like Germany, Austria, Netherlands and heavy importing countries like Greece, Portugal. This Export led vs Import led economies makes us ask the evidences of endogeneity in the Euro Area.

Thanks to such thoughts of Mundell that we have a euro zone, or CEMAC zone. In definitive, this research work found out that joining and adhering to a currency area, is not a linear route since the challenges and pressure emanating from political ideas and socio-cultural differences can't be underestimated.

5. Is The Euro Area An Optimal Currency Area

In line with European project of greater economic integration, a monetary union (EMU) was put in place, and in accordance with the membership of EMU, was the Maastricht convergence criteria. These criteria were a set of economic variables linked to macroeconomic stability that were supposed to act as fulfilment criteria for joining and adhering to the EMU. These convergence criteria slightly weakened the simple criteria laid down by the classical authors of Optimum Currency Area (OCA) theory. The classical framework laid the criteria to which a member (or region) has the right economic situations for joining a currency area with less emphasis on stability per se and with more focus on flexibility and real economic convergence.

Most of the empirical studies investigating Euro area reach a conclusion that at the core of Euro Area, some members like Germany and its neighbours, seem to be in an advanced or developed section of the EMU, and two periphery groups, that is, the Southern and Northern Europe respectively whose conditions for being in the EMU are less optimistic. The architects of the Maastricht Treaty, as a great step towards fuller economic integration and the single market recognized using a single currency.

The simple sharing of the euro amongst its members did not translate an automatic economic performance (economic symmetry) and integration (political unity). We are going to verify if the Euro Area is optimal by reviewing the various criteria.

- Members of the currency area trade extensively with each other,
- The economic cycles in the different regions are in phases (i.e., the regions face symmetric shocks)
- Labor markets are integrated and there is high mobility of labor.
- There are automatic mechanisms (fiscal Equalization) to transfer funds to regions suffering from asymmetric shocks.

Despite the high rate in economic integration, there are still economic and political risks both in southern and some northern euro countries. The southern European countries are attacked by multiple recessions, their economic decrease are deeper and longer than in the rest of regions in the EMU. These uncertainty or risks are from the recent recessions, which are translated and explained by so many factors like;

- Weaknesses in competition between members, for example, Greece imports a good quantity of manufactured goods and other finished goods. This consequently explains the reasons for her slow and weak economic recovery.
- The 2008 debts/financial/sovereign crisis; the crisis has further complicated the smooth functioning of economies and left huge macroeconomic deviations amongst members.
- The sharp fall in real estate especially in Europe especially Greece and Spain

The Euro Area satisfies some of these criteria as seen above; likewise, some are fulfilled as the union progresses as discussed by Jurgen (2009) in the endogeneity evidence. Furthermore, the presence of the 2009 financial crisis in the euro zone is also a soft warning for the criteria of OCA to be re-examined.

This critical analysis shows euro area is an OCA but not a perfect example of an OCA. According to Business Insider of 29 June 2015, the 2004 financial audit report shows that Greece did not qualify to belong to the euro-club because her government budget deficit was above the 3% limit

for admittance. This accounts for the non-fulfilment of the Maastricht convergence conditions.

Since the conception of the Euro zone, it has been highly debated if truly the euro area will succeed in its efforts of total economic integration or it would break-up and return to national currencies? The recent crisis has further worsened the situation and with some countries like Greece yet to recover. The question posed here is to investigate if countries like Greece would be better off if they leave the euro area. Also, it's interesting to find out why despite the crisis in the euro area, there is rather an enlargement of the region instead of a brake-up. The baseline of this argument however revolves around the advantages and disadvantages of leaving the euro area with respect to the current economic crisis.

6. Impacts Of Exchange Rate Volatility On Trade Flows Between The Euro Area And The United States

In this part, an econometric analysis is applied to measure the effects of exchange rate volatility on trade flows. The aim of this analysis is out to find out if exchange rate or exchange rate volatility is important factors in explaining the international trade flows especially in the 2008 financial crisis.

The analysis of currency volatility theory is inspired by the J-curve consequences and the Marshall-Lerner condition. The Marshall Lerner conditions explains how a country's currency depreciation can be corrected using a current account deficit. Price elasticity of demand (PED) for exports plus the price elasticity of demand for import should be greater than one, that is, $(PED_x + PED_m > 1)$. In other words, if the home currency devalues or depreciates, that is the prices of international goods increases in relation to the prices of local goods, the balance of trade will be affected positively because home consumers will buy fewer imports and foreign consumers will purchase more of exports (Welfens, 2009).

The J-curve shows deterioration in a country's balance of payment position when there is a devaluation / depreciation. The J-shape indicates the time series trend. The effect is a phenomenon in which a period of weak or negative output or returns is followed by a slow or weak recovery that

stabilizes at a higher level than before the decline. The situation appears as a ‘J’ shape on a time series.

The trade balance of a country faces the J-curve effect if devaluation of its currency occurs. At first, the total value of imports exceeds its total value of exports resulting in a trade deficit. But eventually, the currency devaluation reduces the price of its exports. Consequently, the country’s level of exports gradually recovers, and the country moves back to a trade surplus (Bremmer, 2007).

This technical part tests the impact of exchange rates and their volatility on trade flows in the Euro Area and the USA. The same test has previously been studied by Huchet-Bourdon and Korinek (2011) for the trade between China, Euro and the United States. A conditional autoregressive-distributed lag (ARDL) is used to measure and model the effects of exchange rate and exchange rate fluctuations on trade flows. The estimations of imports and exports are done in two separate equations; exchange rate and exchange rate volatility, and also, determinants proxy for income (GDP) is also included in these equations. The method was chosen for various reasons; it takes into account the mathematical properties of the time series by verifying stationary or non-stationary of our variables. Cointegration is applied to check the long run as well as short run effects with the associated risk. Since in the ARDL there is no pre-unit test, and there is the measurement of short and long run, it makes it more suitable than the other techniques of cointegration test like that of Johansen, Augmented Dickey-fuller, (ADF), and Watson.

$$M_{,t} = b + b2 Y_{E.A,t} + b3 ER_t + b4 Vol_t + \mu_t \quad (1)$$

$$X_{,t} = b5 + b6 Y_{U.S,t} + b7 ER_t + b8 Vol_t + \varepsilon_t \quad (2)$$

Equation (1) is a reduced form of the equation, derived from demand and supply model in which M is the measure of trade in time period t defined as a ratio of imports of the E.A from the U.S. $Y_{E.A}$ is the measure of production (proxy for income here is GDP), ER is the exchange rate parity of the euro and the dollar (nominal), Vol is the represents exchange rate volatility (risk). The second equation (2) is also a reduced form equation, derived from demand and supply model where X measures the value of exports from E.A to the U.S, $Y_{U.S}$ represents income and ER is the nominal exchange rate.

6.1. Econometric Methodology

The econometric model is formulated in two separate equations of exports and imports with respect to the euro area vis-à-vis her partner. The trade flows equations are modeled as a conditional ARDL-correction model for the E.A and the U.S. The equations incorporate a linear combination of the lagged level of all variables, which represent the error correction term (ECT, second line of each equation). With these specifications, we detect the effects in the short run and long run.

$$\Delta M_t = c_0 + \sum_{k=1}^{n1} c_{1k} \Delta M_{t-k} + \sum_{k=0}^{n2} c_{2k} \Delta Y_{EA,t-k} + \sum_{k=0}^{n3} c_{3k} \Delta ER_{t-k} + \sum_{k=0}^{n4} c_{4k} \Delta Vol_{t-k} \\ + \delta_0 M_{t-1} + \delta_1 Y_{EA,t-1} + \delta_2 ER_{t-1} + \delta_3 Vol_{t-1} + \mu_1$$

$$\Delta X_t = d_0 + \sum_{k=1}^{n1} d_{1k} \Delta X_{t-k} + \sum_{k=0}^{n2} d_{2k} \Delta Y_{US,t-k} + \sum_{k=0}^{n3} d_{3k} \Delta ER_{t-k} + \sum_{k=0}^{n4} d_{4k} \Delta Vol_{t-k} \\ + \lambda_0 X_{t-1} + \lambda_1 Y_{US,t-1} + \lambda_2 ER_{t-1} + \lambda_3 Vol_{t-1} + \xi t$$

The following steps will guide the analysis

6.2. The Process of Cointegrations

To check for cointegration or significance of the lagged variables, we refer results to the standard F-test, which is the first step in estimating the error correction. In this stage, Pesaran et al, (2001) propose a fixed number of lags to be added to the differenced variable. The estimations are by Ordinary Least Square and the different models of ARDL for all lags with a maximum of 12 lags. To select the best model of the lags for this analysis, the Akaike's information criterion (AIC) and Schwartz Bayesian Criterion (SBC) also known as Schwartz information criteria (SIC) are applied to select the best lags for the model. The model with the smallest value is selected.

Cointegration is then tested using OLS estimations by restricting all estimated coefficients of lagged level variables equal to zero ($\lambda_0 = \lambda_1 = \lambda_2 = \lambda_3 = 0$) the null hypothesis is then tested against alternative for cointegration

using the F-test with an asymptotic non-standard distribution. When the F-statistics is above the upper band, the null is rejected, hence justifying the presence of cointegration. If this value thus fall below the band, the null can't be rejected, thus a situation of no cointegration indicative of such a result. When the F-statistics fall within the band, the results are difficult to interpret. That is why it is referred to as a bound test, because it falls between the bounds because the two sets of critical values indicate possibilities of the regressors into purely I(0), I(1) or mutually integrated. After the confirmation of the existence of long-term relationship between the variables, the long run and short run model is thus derived. The error correction term is then formed from these estimates λ_0 - λ_3 as ECT_{t-1} .

The ECT_{t-1} is then introduced and it replaces the linear combination of the lagged variables and re-estimated by using the same lag as before. The velocity of recovery back to the long run equilibrium is then measured by the coefficient obtained from this ECT_{t-1} . A negative coefficient that is also significant indicates the speed of adjustment back to the equilibrium and also justifies the presence of cointegration amongst the variables (Bahmani & Ardalani, 2006). The greater the coefficient, the more rapid the economy is to return back to equilibrium.

In the concluding part, a cumulative sum (CUSUM) and cumulative sum of square test (CUSUMQ) test for stability are tested for long run and short run stability test of Brown et al, (1975). Serial correlation is checked using the specifications of LM-test of non-autocorrelation of residuals and Ramsey Reset specification test.

$$W_r = \frac{1}{\hat{\sigma}_{ols}} \sum_{j=k+1}^r v_j, r = k+1, k+2, \dots, n$$

The tests (CUSUM and CUSUMQ) are based on a recursive residual that rely on the first j observations. Also the tests are demonstrated on a graph with assumption of a 5 % significance level where W and a pair of straight lines for values of $r = k+1, k+2, n$.

Since there is no pre-unit-testing test here, we proceed by differencing the variables and after which we select suitable lags in the guidelines of AIC

and SIC. In this research, testing and selection started with 12 lags to see the model that aptly satisfies the SIC and AIC criteria. In this case, the export and import equations were introduced 3-lags which had the lowest values of SIC and AIC criteria. Thus, the formulation of the distributed lag model was as follows,

The Normal Model:

$$\begin{aligned} M &= b_1 + b_2 * GDP_{E.A} + b_3 * ER + b_4 * Vol \\ X &= b_5 + b_6 * GDP_{U.S} + b_7 * ER + b_8 * Vol \end{aligned}$$

M=imports, X=Exports, GDP= Gross domestic product, ER=Exchange rates, Vol=ER Volatility

The model used 3-lags; The software used for the analysis is Eviews (IHS Global Inc.) version 8.

6.3. Procedures to Test Long-Term Relationship (Cointegration)

After selecting the perfect model, the following are tested;

1. Stability Diagnostics via recursive estimate (Ordinary Least Square), that is, CASUM and CASUMQ by plotting W and a pair of straight lines for values of $r=k+1, k+2, n$. assuming a 5% significance level for CASUM and CASUMQ
2. Serial correlation; LM test verifying the R^2 & P values. If $>5\%$ we Accept the Null Hypothesis and attesting no serial correlation
3. Bound testing; Bound testing via coefficient diagnostic using WALD test compared with the Pesaran Critical values at 5% significance. The F-statistics is then compared within the bounds. If $F\text{-stat} >$ upper limit, we confirm cointegration (reject the null) if below, no cointegration, within, inconclusive.
4. The next is to develop the SR & LR model by establishing the error correction term $d(m) c d(m(-1)) d(m(-2)) d(m(-3)) d(gu(-1)) d(gu(-2)) d(gu(-3)) d(e(-1)) d(e(-2)) d(e(-3)) d(v(-1)) d(v(-2)) d(v(-3))$ ECT(-1)
5. After correcting the model, the ECT coefficient is obtained. A negative and significant coefficient is desirable because it indicates the speed of recovery back to the equilibrium.

6. The model is then tested for -Serial correlation and stability diagnostic as specified above.
7. The last step is to restrict the independent variables and check the short run causality amongst the lagged variables to see the short run impacts
8. Where null hypothesis is rejected in case the probability is not equal to zero

7. Results

The econometric model reveals that the effect of exchange rate variations in the recent crisis affects exports more than imports. The ECT is both significant and negative, which confirms the presence of cointegration between variables (Bahmani-Oskooe & Ardalani, 2006). In testing for a long-run relationship between variables, the study found out that there was the existence of cointegration amongst variables both at the level of exports and imports. The study was able to distinguish the long run impacts as well as short run impacts using the Walt test to diagnose the coefficients.

The results demonstrated that long run equilibrium could be re-gained at the speed of 14.9% and 15.32% and for imports and exports respectively. The short-run causality/ effects were generally minimal as regards exchange rate in this study.

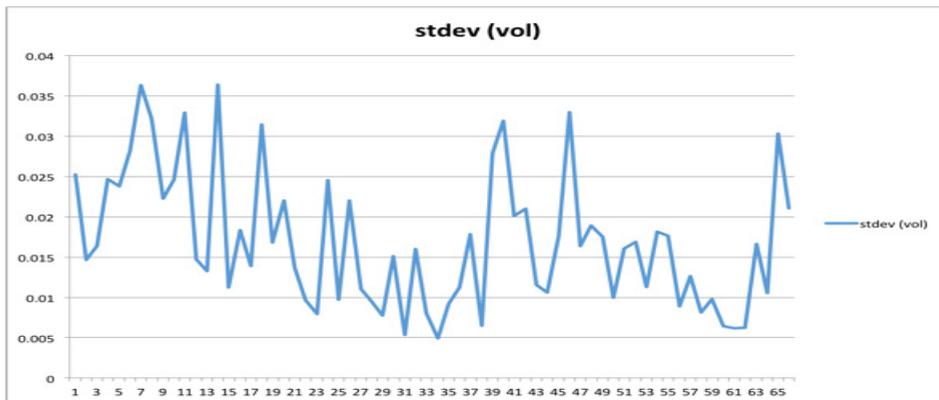


Figure 1: Exchange rate volatility calculated as standard deviation of exchange rate

The above figure shows how volatile exchange rate in the euro area has been since 1999. The figure further shows that in the early years when the euro was launched, the exchange rate was volatile and around 2008 it went again very high. The volatility calculations are based on standard deviation. The data is daily movement of exchange rate fluctuations, which is later converted to a quarterly time series data.

Table 2. Summary of empirical results or findings

| Description | Export Model/Equation | Import Model/Equation |
|--|--|---|
| Number of Lags used and their SIC & AIC values | 3-lags; AIC=-1.976868 and SIC=-1.383471 | 3 lags; AIC= -2.318051 and SIC= -1.724654 |
| Stability diagnostics via recursive estimate; CASUM & CASUMQ | Stable at 5% significance level | Stable at 5% significance level |
| Serial Correlation; LM test via R ² and Probability values | Acceptance of null hypothesis thus attesting no serial correlation at 5% significance. | Acceptance of null hypothesis thus attesting no serial correlation at 5% significance. |
| Coefficients diagnostics using WALD test and the Pesaran Critical values (Bound Testing) | Confirmation of cointegration because the F-statistics > upper limit of the Pesaran critical value at 5 % significance, thus, we reject the null for the alternative hypothesis for all the coefficients variables tested. | Confirmation of cointegration because the F-statistics > upper limit of the Pesaran critical value at 5 % significance, thus, we reject the null for the alternative hypothesis for all the coefficients of the variables tested. |
| Error Correction Term (Speed of recovery back to the long run equilibrium) | -15.32%; in absolute values. A negative and larger coefficient is desirable as it indicates the velocity to re-adjust back to the long run macroeconomic equilibrium. | -14.9%; in absolute values. A negative and larger coefficient is desirable as it indicates the velocity to re-adjust back to the long run equilibrium. |

8. Conclusion

The aim of this study was to find out if the present Euro club is an Optimal Currency Area and also to measure the impacts of the recent financial crisis in the said region. The study was able to trace divergence in the economies of Euro area member states characterized by the transmission of asymmetric shocks leading to macroeconomic disequilibrium. This paper was equally interested in tracing the origin of the financial crisis in Europe. The study suggests Greece situation reflects the weakness that had culminated in the euro zone.

This study also joined other studies to confirm that some OCA criteria are fulfilled ex-post that were not satisfied ex-ante.

As a further recommendation would be suggestion of a political union for the Euro area in order to cope with the management of both fiscal and monetary policies, a political union is highly solicited to wave the pain arising from cultural, political and linguistic barriers. The political willingness of states to function and regard each other as one is very necessary in an Optimum Currency Area-if there were no such barriers, the recent shock would not only concentrate in the Greek economy.

In this technical analysis, the study, traced weak short run effects on imports and exports and relatively significant impacts in the long run. It's confirmed in this work that exchange rate variations affects exports more than imports and their ability to recover back to the equilibrium was possible in the long run.

The study found out that exchange rates are not the only drivers of trade flows, because trade imbalances may be provoked by differentials in international market process, which hampers trade balances. Exchange rate affects the current account via competitiveness. In this study, an autoregressive distributed lag model was used, the results showed that in the short run, there is no short-run causality running from lag 1 to 2 and to 3, thereby contrasting the null hypothesis in favor of the alternative hypothesis as indicated by their probabilities. For the long run, an estimation of the error correction term coefficients pointed out the effects and possibility of recovery in the long run.

REFERENCES

- [1] Alojzy Z, N. and Yochanan, S. (2012). *Failing Institutions Are at the Core of the Euro Crisis*, Penn Institute of Economic Research, Philadelphia.
- [2] Bahmani-Oskooee, M. and Mitra, R. (2008). Exchange rate risk and commodity trade between the US and India, *Open Economies Review*, 19, p. 71-80
- [3] Bayoumi, T. and Eichengreen, B.(1992). “Shocking Aspects of Monetary Unification”, *National Bureau Economic Research Working Paper*, No. 3949
- [4] Bayoumi, T. Harmsen, R and Jarkko Turunen (2011) “Euro Area Export Performance and Competitiveness”. *International Monetary Fund. Working Paper No:11/140* <http://core.ac.uk/download/pdf/6746131.pdf>
- [5] Bremmer, I. (2007). The J-Curve: A new way to understand why nations rise and fall, viewed on the 30 June 2015 < <http://www.amazon.co.uk/The-Curve-Understand-Nations-Rise/dp/0743274725>>
- [6] Brown, R.L, Durbin, J. and Evans J, M. (1975). Techniques for testing the constancy of regression relationships over time, *Journal of the Royal Statistical Society, Series B*, 149-162
- [7] De Grauwe, P. and Ji, Y. (2013). *Economics of Monetary Union*, 9th edn, Oxford University Press, Oxford.
- [8] De Grauwe, P. (1992) “German Monetary Unification”, *European Economic Review*, 36, pp. 445-453.
- [9] Engle, R, F. and Granger, C,W,J. (1987) Cointegration and error-correction: representation, estimation and testing, *Econometrica*, 55, p. 1251-1276

- [10] Horvath, J. (2003). ‘‘Optimum Currency Area Theory: A Selective review’’ *Bank of Finland Institute for Economies in Transition*, Discussion papers No 15.
- [11] Huchet-Bourdon, M. and Korinek, J. (2011). ‘‘To What Extent Do Exchange Rates and their Volatility Affect Trade?’’, OECD Trade Policy Papers, No. 119, OECD Publishing. <<http://dx.doi.org/10.1787/5kg3slm7b8hg-en>>
- [12] Ishiyama, Y. (1975). ‘‘ The Theory of Optimum Currency Areas: A Survey’’, *IMF Staff Papers*, 22, pp. 344-83.
- [13] Johansen, S. (1995). Likelihood based inference on cointegration in the vector autoregressive model, Oxford university press
- [14] Jurgen, M. (2009). ‘‘Ten Years EMU – Reality Test for the OCA Endogeneity Hypothesis, Economic Divergences and Future Challenges’’ *Intereconomics* No, 44(2) pp114-128.
- [15] Kenen, P. (1969). ‘‘The Theory of Optimum Currency Areas, An Eclectic View’’, in Mundell and Swoboda (eds.) *Monetary Problems in the International Economy*, University of Chicago
- [16] Lanyi, A. (1969). ‘‘The Case for Floating Exchange Rates Reconsidered’’, *Essays in International Finance* No. 72 viewed on 12 January 2015, < https://www.princeton.edu/~ies/IES_Essays/E72.pdf>
- [17] Larosière, J. (2) financial supervision in the European Union. Viewed on 4 April 2015, < http://ec.europa.eu/finance/general-policy/docs/de_larosiere_report_en.pdf>.
- [18] McKinnon, R. (1963). American Economic Association: Optimum Currency Areas *The American Economic Review*, Vol. 53, No. 4 pp. 717-725

- [19] Mundell, R. (1973). "Uncommon Arguments for Common Currencies", in H.G. Johnson and A.K. Swoboda (eds.), *The Economics of Common Currencies*, George Allen & Unwin Ltd, London, pp. 114-32.
- [20] Mundell, R. (1961). *A Theory of Optimum Currency Areas*, American Economic Review, pp 657-665.
- [21] Pesaran Hashem, M., Shin, Y. and Smith, R.J. (2001). Bounds Testing approaches to the analysis of level relationships. *Journal of Applied Econometrics*, 16, p. 289-326.
- [22] Philip, R. L. (2012). "The European Sovereign Debt Crisis" *The Journal of Economic Perspective* Vol. 26, No. 3, pp. 49-6.
- [23] Tanja, B. (2005). "The Theory of Optimum Currency Areas: A Literature Review", *Privredna kretanja i ekonomska politika* No, 104.
- [24] Tavlas, G. S. (1993). "The 'New' Theory of Optimum Currency Areas", *The World Economy*, 16, pp. 663-685.
- [25] Welfens, P., J., J. (2009). *Marshall-Lerner Condition and Economic Globalization*, EIIW, Volume 168.
- [26] Yellen, J,L. (2014). "Monetary policy and financial stability" *The 2014 Michel Camdessus Central Banking Lecture International Monetary Fund*, Washington, D.C.
- [27] European Commission. (2015). *Economic and Financial Affairs, the Euro, Adopting the Euro, Convergence reports*, viewed on 17 June 2015, <http://ec.europa.eu/economy_finance/euro/adoption/euro_area/index_en.htm>.
- [28] European Commission. (1999). *Economic and financial Affairs, How the EU works, History*, viewed on 17 June <http://ec.europa.eu/economy_finance/publications/publication7454_en.pdf>.

- [29] European Commission (1990). One Market, One Money: An evaluation of potential benefits and costs of forming an economic and monetary union, European Economy No 44 October 1990, viewed on 30 September 2014, <http://ec.europa.eu/economy_finance/publications/publication7454_en.pdf>

- [30] European Central Bank, Eurosystem (2015). Statistical data warehouse: Selected indicators for the Euro area, viewed on 30 March 2015, < <http://sdw.ecb.europa.eu>>.

- [31] Federal Reserve (2015). Statement on longer-run goals and monetary policy strategy viewed on 30 January 2015, <http://www.federalreserve.gov/monetarypolicy/files/FOMC_LongerRunGoals.pdf>

- [32] United States Census Bureau (2015). U.S trade in goods by country viewed on 30 March 2015, < <http://www.census.gov/foreign-trade/balance/index.html>>.

- [33] Organization for Economic Cooperation and Development (2015). Quarterly GDP figures on the Euro area and United States viewed on 30 March 2015, <<https://data.oecd.org/gdp/quarterly-gdp.htm#indicator-chart>>